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CURRENT TRENDS IN PHARMACEUTICAL RESEARCH

The Official Journal of the Department of Pharmaceutical Sciences

SPECIAL ISSUE FOR ABSTRACTS

International Conference
on
"Holistic Therapeutic Intervention and Translational Research"
(13th & 14th March, 2026)

Organized By
DEPARTMENT OF PHARMACEUTICAL SCIENCES

Dibrugarh University

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Current Trends In Pharmaceutical Research (Special Issue) 2026
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Editorial

It is both an honour and a privilege to present the ABSTRACT Book of the International Conference organized by the Department of Pharmaceutical Sciences, Dibrugarh University, held on 13–14 March 2026 at Dibrugarh University, Assam, India. This volume brings together a rich collection of scholarly contributions from researchers, academicians, industry professionals, and students, reflecting the vibrant intellectual exchange that lies at the heart of scientific advancement.

Established in 1965, Dibrugarh University stands as the easternmost university of India and has evolved into a distinguished centre of higher learning, research, and innovation. Guided by its enduring vision of integrating knowledge, skill, human values, and compassion for the betterment of society, the University has continually fostered an academic environment that encourages inquiry, creativity, and interdisciplinary collaboration. The Department of Pharmaceutical Sciences proudly upholds this legacy by organizing a conference that seeks to bridge the gap between academia, industry, and research institutions.

In an era marked by rapid technological evolution and growing global health challenges, the field of pharmaceutical sciences continues to expand its boundaries through innovation, scientific rigor, and collaborative engagement. This international conference has been conceptualized as a dynamic forum where leading scholars, researchers, and scientists can converge to deliberate on emerging trends, share cutting-edge discoveries, and explore transformative ideas that have the potential to shape the future of healthcare and pharmaceutical development.

The themes encompassed within this conference reflect the multifaceted and interdisciplinary nature of contemporary pharmaceutical research. Areas such as pharmaceutical technology, manufacturing and scale-up processes, quality control and quality assurance, clinical trials and pharmacovigilance, drug discovery and delivery systems, cellular targeting, artificial intelligence in environmental monitoring, nutraceuticals, industrial biotechnology, and plant molecular biotechnology collectively represent the evolving frontiers of scientific exploration. By bringing together expertise from these diverse yet interconnected domains, the conference aims to stimulate dialogue that transcends traditional disciplinary boundaries.

The ABSTRACTs compiled in this special edition of CTPR (Current Trends in Pharmaceutical Research), the official journal of the Department of Pharmaceutical Sciences, Dibrugarh University, represent the culmination of dedicated research efforts and intellectual curiosity. They highlight innovative methodologies, novel therapeutic approaches, and critical analyses that contribute meaningfully to the advancement of pharmaceutical and biotechnological sciences. The publication of these ABSTRACTs in the journal further underscores the academic significance of the conference and provides a valuable platform for disseminating contemporary research developments to a wider scholarly audience.

We extend our sincere appreciation to all authors whose valuable contributions have enriched this ABSTRACT volume. Our heartfelt gratitude is also conveyed to the distinguished keynote speakers, invited experts, and session chairs who have graciously shared their insights and expertise, thereby elevating the academic discourse of the conference. The successful organization of this event would not have been possible without the unwavering support and guidance of the advisory committee, organizing committee, and numerous volunteers whose dedication and meticulous efforts ensured its realization.

It is our earnest hope that this ABSTRACT book will serve not only as a repository of the scientific contributions presented during the conference but also as a source of inspiration for continued inquiry and collaboration. May the exchange of ideas fostered through this gathering catalyze innovative research, strengthen academic partnerships, and contribute to the development of sustainable and impactful solutions for the betterment of global healthcare.

— **Dr. Biman Bhuyan**

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Category: Keynote Lecture

HERBAL PHARMACEUTICALS IN TRANSLATIONAL RESEARCH ON MODERN MEDICINES FOR HUMAN WELFARE

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ABSTRACT

A Large number of compounds are available in the market today across the world for control, prevention and treatment of diseases of not only of human but also for animal too in the society. Many of such medicines are synthetic, while numerous plants derived compounds are being used for the said purpose. These pharmaceuticals help in treatment of various health problems, sometime even as lifesaving drugs. At the same time, a number of health issues are still prevailed, where scientists looking for new effective compounds. Various types of cancers, immunological disorders, infectious diseases, physiological disorders, neurological disorder are still waiting for challenging curative medicine in the society. Many of the synthetic drugs brought questions for its toxicity on human health. In recent decades scientists across the globe are looking for alternative herbal compounds/ formulations as curative medicines without toxic effects on human health. Discovery of Artemisinin from Artemisia annua is one of the examples for herbal medicines of 21st Century, that leads to the award of Nobel Prize in the year 2015 to Chinese Scientist Tu Youyou. It is strongly believed that multidisciplinary research on phytocompounds shall bring information on new pharmaceuticals for human health in coming decades. Many such herbs and herbal medicines are mentioned in Indian ancient literature for different use. However, the most challenging health problem stands in front of human civilization is the misuse of nuclear energy. It could cause the birth of genetically mutilated babies in the next generation. Moreover, it may appear as an indiscriminate annihilator not only for the vanquished enemy, but also for the victorious winner.

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CISPLATIN–ORAL MICROBIOTA SYNERGISTIC ROLE IN HNSCC AGGRESSIVENESS AND ITS CLINICAL RELEVANCE

Partha Jyoti Saikia[1], Lekhika Pathak[1] Bidisha Pal[2], Upasha Sarmah[1], Tulika Sarma[3], Chayanika Das[3], Debduti Datta[1], Rupam Das[3], Bikul Das[1,2,3*]

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ABSTRACT

***Objective*:** The objective of this study is to investigate whether oral microbiota synergistically enhances cisplatin-induced aggressiveness in HNSCC by reprogramming cancer cells into a therapy-resistant Tumour Stemness Defence (TSD) state.

***Background*:** Cisplatin-based chemotherapy remains a cornerstone for treating Head and Neck Squamous Cell Carcinoma (HNSCC). However, its therapeutic success is often limited in patients with advanced-stage disease (Stage III–IIIb). Emerging evidence indicates that chemotherapy itself may induce or select for aggressive, therapy-resistant tumour phenotypes. Meanwhile, dysbiosis of the oral microbiota—particularly involving *Fusobacterium nucleatum* and *Porphyromonas gingivalis*—has been implicated in HNSCC progression and immune evasion. Yet, the synergistic interplay between cisplatin treatment and oral microbial ecology remains poorly understood. Here, we investigate whether oral microbiota enhance cisplatin-induced aggressiveness via reprogramming of cancer stem cell (CSC) phenotypes, particularly the Tumour Stemness Defence (TSD) state, which represents an adaptive altruistic response to therapy-induced stress.

***Methods*:** Saliva samples were prospectively collected from 15 HNSCC patients prior to initiation of cisplatin-based chemotherapy. The microbiome composition was analyzed using 16S rRNA gene sequencing and targeted qPCR for *F. nucleatum* and *P. gingivalis*. In vitro, these isolates were co-cultured with SAS HNSCC cells (MOI 50:1) and treated with cisplatin (1–5 µM) for three days. Post-treatment recovery was monitored up to 14 days, with assessments of colony formation, migration, and expression of TSD-associated stemness markers (EpCAM, ABCG2, HIF-2α, Myc, SOX2, OCT4, NANOG). Clinically, post-therapy salivary microbiota was correlated with patient outcomes and tumour hypoxia profiles.
***Results*:** Co-exposure of SAS cells to cisplatin and *F. nucleatum* or *P. gingivalis* led to the emergence of a TSD-like phenotype, characterized by elevated expression of HIF-2α, ABCG2, and Myc, increased clonogenic survival, and enhanced migration capacity. This reprogramming effect was attenuated by TLR4 inhibition. Patient saliva analysis revealed that elevated microbial LPS load and enrichment of F. nucleatum correlated with poor chemotherapy response and higher CTC count during treatment.

Conclusion: Our findings reveal that the oral microbiota synergises with cisplatin to promote therapy-induced adaptive stemness in HNSCC. This mechanism, involving microbial LPS/TLR4 signalling and HIF-2α activation, suggests that oral microbial dysbiosis may act as a co-driver of tumour evolution under chemotherapeutic stress. Targeting microbiota–chemotherapy interactions may offer a new avenue to reduce post-therapy relapse.

Keywords: Tumour Stemness Defence, Head and Neck Squamous cell Carcinoma, Oral Microbiota

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TARGETING THE OXIDATIVE STRESS–INFLAMMATION AXIS: TRANSLATIONAL INSIGHTS FROM ETHNIC FUNCTIONAL FOODS AND NATURAL PRODUCTS OF NORTHEAST INDIA

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ABSTRACT

Chronic diseases, including cancer, metabolic disorders, and inflammatory pathologies, are increasingly recognized as consequences of persistent dysregulation of the oxidative stress-inflammation axis. Reactive oxygen species (ROS) and redox-sensitive transcription factors such as NF-ķB and Nrf2 orchestrate a complex molecular network that governs cellular survival, immune responses, and tissue remodeling. Therapeutic strategies that precisely modulate this axis – rather than indiscriminately suppress oxidative stress- represent a promising frontier in translational medicine. Northeast India, a biodiversity hotspot, offers a unique repository of functional bioresources, including ethnic fermented foods and indigenous fruits with long-standing ethnomedicinal relevance. Traditional fermented soybean (Akhuni), fermented mustard (Tam-um, Tam-um tengkhang), and underexplored citrus and wild edible fruits such as *Citrus macroptera*, *Garcinia xanthochymus*, and *Meyna spinosa* are rich in polyphenols, flavonoids, limonoids, and probiotic metabolites. Emerging pharmacological and metabolic investigations reveal these bioactives function as context-dependent redox modulators – exerting antioxidant effects in normal physiological states while inducing selective pro-oxidant stress in cancer cells, thereby triggering mitochondrial apoptosis, immune reprogramming, and suppression of inflammatory signaling pathways. These findings indicate the translational potential of bioactive compounds derived from traditional foods and indigenous fruits of northeast India as promising candidates for therapeutic strategies targeting oxidative stress-inflammation

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ROLE OF IL-17A SIGNALLING IN ALZHEIMER'S DISEASE AND APPROACHES FOR ITS MODULATION IN DISEASE PROGRESSION

Avtar Singh Gautam, Rakesh Kumar Singh*

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ABSTRACT

***Background*:** Neuroinflammation is one of the common hallmarks of Alzheimer's disease (AD) and is characterized by the production of inflammatory mediators in the central nervous system due to the activation of immune cells in response to antigenic stimulus. Interleukin-17A (IL-17A) is one of the crucial cytokines involved in orchestrating neuroinflammation and exacerbating AD pathology. Elevation of IL-17A level have been found to be significantly associated with AD patients and is involved in amplification of neuroinflammation during AD pathology. Thus, IL-17A may be considered as one of the key therapeutic options to control AD progression. However, a clear direct association between the levels of IL-17 and various neurodegenerative diseases is inconclusive due to lack of consistent results reported in several studies.

***Objectives*:** We aimed to validate the role of Il-17A and its downstream signaling its role through (1) a meta-analysis study to assess the levels of IL-17 cytokine in various neurodegenerative diseases, (2) in vitro characterization in amyloid-beta induced cells (3) the ability of IL-17 A to exacerbate amyloid-beta-induced pathology in animals, (4) Therapeutic targeting of through direct IL-17 neutralizing antibodies in amyloid-beta AD mouse model.

***Methods*:** Objective 1 – We conducted a meta-analysis study to assess the level of IL-17 in cerebrospinal fluid/serum of the patients with AD. An extensive search was performed on electronic databases including PubMed, Cochrane, and Google Scholar to find out the relevant studies for analysis. The quality of selected studies was assessed by Newcastle–Ottawa scale for cohort and case control studies. The standardized mean difference of level of IL-17 in patients with neurodegenerative diseases and control was calculated using RevMan 5 software.

Objective 2 – We used rat peripheral blood mononuclear cells (PBMCs) as a model to study their interaction with Aβ, evident in AD. We used Aβ25-35 to stimulate PBMCs, as this shortest peptide fragment is produced from proteolytic cleavage of soluble Aβ peptides in the brain of aged patients, and both the monomeric and aggregated form of Aβ25-35 retains the cytotoxic properties of the full-length peptide.

Objective 3 - The AD pathology was induced with repeated intranasal administration of Aβ1-42 along with recombinant mouse IL-17 A (rmIL-17) at 1, 2 and 4 µg/kg exposure on alternate days for 2 weeks.

Objective 4 - This study was conducted using BALB/c mice divided into four groups, such as control group, $A\beta_{1-42}$ (5 µg) group, $A\beta_{1-42}$ (5 µg) + IL-17A neutralizing antibody (1 µg) group, and $A\beta_{1-42}$ (5 µg) + antibody control (IgG1 isotype, 1 µg) group. The intranasal exposure of either $A\ss_{1-42}$ or vehicle was administered once daily for the first seven consecutive days. The intranasal exposure to anti-mouse IL-17A neutralizing antibody or isotype control was performed once daily from day 5 to day 7, one hour after $A\ss_{1-42}$ exposure. The memory evaluations were conducted through the Morris water maze, novel object recognition test, and passive avoidance test.

***Results*:** Result summary for objective 1 - A significant increase in the level of serum IL-17 was found to in the patients with neurodegenerative diseases like Alzheimer's disease ($p = 0.001$)

Result summary for objective 2 - Aß25-35-triggered release of IL-17A and IL-17A-mediated singling in rat PBMCs, clearly pointing towards the potential of IL-17A mediated inflammation in rat PBMCs.

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Result summary for objective 3 - Although, the combination of rmIL-17 and Aβ did not have severe effects on memory of the animals, but it drastically increased the IL-17 A mediated signaling, level of proinflammatory cytokines, oxidative stress and reduced antioxidants in the hippocampus and cortex regions of the animal brains. Interestingly, combining rmIL-17 with Aβ also triggered the expression of AD structural markers like pTau, amyloid-beta and BACE1 in the brain regions. Furthermore, rmIL-17 with Aβ exposure stimulated astrocytes and microglia leading to activation of proinflammatory signaling in the brain of the animals.

Result summary for objective 4 - IL-17A antibody exposure led to significant partial improvement in cognitive memory and significantly reduced the expression of AD biomarkers (amyloid precursor protein, beta secretase, phosphorylated tau) along with a significant suppression of IL-17A signaling axis, astrogliosis, neuronal damage and cytokines in the brain regions of $A\beta_{1-42}$-exposed animals.

***Conclusion*:** In conclusion, neutralizing IL-17A prevented $A\beta_{1-42}$-mediated effects and revealed IL-17A as a potential therapeutic target involved in the regulation of AD progression and pathology.

Keywords: Alzheimer's disease, Interleukin-17, Neuroinflammation, Amyloid beta1-42, IL-17A signaling

Funding: Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, Govt. of India.

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GUT MICROBIOME MODULATION AS A STRATEGY TO COMBAT ANTIMICROBIAL RESISTANCE

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ABSTRACT

Antimicrobial resistance (AMR) is one of the most pressing global public health challenges of the 21st century, threatening the effectiveness of modern medicine and the control of infectious diseases. While misuse and overuse of antibiotics remain major drivers of resistance, increasing evidence indicates that the human gut microbiome is a critical reservoir and ecological hub for antimicrobial resistance genes. Disruption of gut microbial homeostasis, particularly following antibiotic exposure, can promote colonization by resistant organisms and facilitate horizontal transfer of resistance determinants. Consequently, strategies aimed at preserving or restoring microbial balance are emerging as promising complementary approaches to mitigate AMR.

Modulation of the gut microbiome through dietary interventions, probiotics, prebiotics, and microbiome-directed therapeutics has gained attention as a sustainable strategy to enhance colonization resistance and limit the expansion of antimicrobial-resistant pathogens. In addition, natural bioactive compounds derived from medicinal plants, herbal formulations, and essential oils are increasingly explored for their antimicrobial, antioxidant, and microbiome-modulating properties. Such compounds may exert targeted antimicrobial effects while potentially placing less selective pressure on resistance development.

Research conducted by our group in Sri Lanka has contributed to understanding the epidemiology and molecular mechanisms of antimicrobial resistance in both clinical and community settings. Our studies have demonstrated the growing burden of β-lactamase–mediated resistance in Enterobacterales and the complex resistance determinants involved in its dissemination. Complementary investigations have also explored the antimicrobial potential of natural products, including plant extracts from the Sri Lankan endemic species and polyherbal formulations, which may serve as alternative or adjunct antimicrobial strategies.

Emerging insights into the gut microbiome, microbiome-based interventions, and plant-derived bioactive compounds highlight innovative strategies to reduce antibiotic dependence and combat the global AMR burden.

Keywords: Gut microbiome, antimicrobial resistance, microbiome modulation, plant-derived antimicrobials.

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REVERSING INTELLECTUAL DISABILITY IN DOWN SYNDROME: INSIGHTS FROM ANIMAL AND HUMAN INDUCED PLURIPOTENT STEM CELL MODELS

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ABSTRACT

Background: Down syndrome (DS) is the most common genetic cause of intellectual disability, characterised by disrupted neurodevelopment and cognitive deficits.

Objective**:** We investigated key molecular drivers of DS brain abnormalities and tested therapeutic strategies to restore neuron production and learning in DS models. Methods: Using a trisomic DS mouse model, we examined the JAK–STAT pathway's impact on neural lineage specification and tested the effects of the JAK1/2 inhibitor ruxolitinib. We also studied human DS neural cells and isogenic DS hiPSC-derived neural progenitors, neurons, astrocytes, and cerebral organoids to assess the role of the transcriptional repressor REST. REST activity was enhanced pharmacologically (via lithium) to evaluate rescue of DS phenotypes.

Results**:** In DS mice we found aberrant JAK–STAT activation causing a shift from neurogenesis to gliogenesis and fewer neurons. Inhibiting JAK–STAT with ruxolitinib normalised the neuron:astrocyte ratio and markedly improved hippocampal-dependent learning and memory. In human DS neural models, REST was downregulated, leading to an excess of astrocytic fate, oxidative stress, and synaptic impairment. REST enhancement (paralleling JAK–STAT blockade) corrected gene expression and reduced astrocyte reactivity. Lithium treatment (which restores nuclear REST) in DS hiPSC-derived cultures normalised neurogenic gene programs, diminished reactive glial phenotypes, and rescued synaptic function.

Conclusion**:** These findings highlight a critical REST–JAK–STAT regulatory axis driving DS neuropathology. Importantly, both JAK inhibition and REST activation effectively reverse neurogenic defects and improve cognitive functions in DS models. Targeting this pathway offers a promising strategy for reversing intellectual disabilities in Down syndrome.

Keywords: Down syndrome, neurogenic-to-gliogenic shift, intellectual disabilities

Funding: The work presented here is funded by Malaysian Ministry of Higher Education Fundamental Research Grant Scheme (FRGS/1/2022/SKK10/UPM/02/4) and Universiti Putra Malaysia Geran Putra Berimpak (GPB/2024/9810200).

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SCOPE OF NANO-FORMULATIONS FOR BRAIN TARGETED DRUG DELIVERY

Praveen TK*

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ABSTRACT

The majority of medications employed in central nervous system (CNS) illnesses are unable to traverse the blood-brain barrier (BBB) owing to their substantial molecular size, limited solubility in lipids, and the efflux process mediated by p-glycoprotein, leading to diminished drug concentration within the brain. The presentation provides an overview of the existing approaches employed in the application of nano drug delivery to the brain, including polymeric nanoparticles, solid lipid nanoparticles, liposomes, dendrimers, miscelles, and nanoemulsions. Moreover, the presentation also elucidates the research methodologies pertaining to the advancement of Benzyl Quinolone Carboxylic Acid (BQCA) lipid drug conjugates nanoparticles surface modified with polysorbate-80 (BQCA-SA-P80-NPs) in order to enhance brain bioavailability of BQCA and facilitate targeted delivery to the brain, thereby enhancing its efficacy in the treatment of Alzheimer's Disease.

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ROLE OF PLANT POLYSACCHARIDES IN DRUG DELIVERY AND THEIR BIOLOGICAL PERFORMANCE BY VISUALIZATION TECHNIQUES

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ABSTRACT

***Background*:** Plant polysaccharides have emerged as versatile biomaterials in pharmaceutical research due to their inherent biocompatibility, low toxicity and structural diversity. Beyond their traditional role as excipients, these polymers exhibit intrinsic biological activities including immunomodulation, antioxidant, and anti-inflammatory effects. However, understanding their time-dependent behavior in biological systems remains challenging.

***Objective*:** This review aims to comprehensively analyze the dual functionality of plant polysaccharides as drug delivery vehicles and bioactive agents, with particular emphasis on how modern visualization techniques have elucidated their biological performance and distribution patterns.

***Methods*:** Recent literature was systematically reviewed focusing on polysaccharide-based delivery systems and advanced imaging modalities including matrix-assisted laser desorption/ionization mass spectrometry imaging (MALDI-MSI), super-resolution fluorescence microscopy (dSTORM), confocal laser scanning microscopy, and atomic force microscopy. These techniques enable real-time tracking of polysaccharide behavior at molecular to tissue levels.

***Results*:** Plant polysaccharides demonstrate remarkable capacity for controlled drug release, targeted delivery, and synergistic therapeutic effects through the 'drug-excipient unification' concept. Visualization studies have revealed their spatial distribution in biological matrices, real-time cellular interactions, and dynamic remodeling during physiological processes. Techniques such as MALDI-MSI have successfully mapped polysaccharide localization in tissues, while single-molecule imaging has provided insights into cell wall polysaccharide biosynthesis and degradation dynamics.

***Conclusion*:** Advanced visualization techniques have revolutionized our understanding of plant polysaccharide behavior in biological systems, establishing their potential as multifunctional platforms for next-generation therapeutics. This integration of delivery science with molecular imaging paves the way for rationally designed polysaccharide-based formulations with enhanced efficacy and predictable in vivo performance.

Keywords: Plant polysaccharides, drug delivery systems, visualization techniques, MALDI-MSI,

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NEPHROPROTECTIVE EFFICACY OF *Allium hookeri* ROOTS AGAINST CYCLOSPORINE-INDUCED NEPHROTOXICITY: A PRECLINICAL STUDY

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ABSTRACT

***Background*:** *Allium hookeri* Thwaites is an evergreen vegetative herb widely utilized as folklore medicine by the Meitei community of Manipur as anti-ulcer agent, anti-hypertensive agent and cardio-protective agent by various preparation methods. *A. hookeri* root contains bioactive compounds such as s-allylcysteine, allicin, cycloalliin, linoleic acid, ferulic acid, etc. Moreover, scientific study reported the anti-inflammatory, anti-oxidant, neuroprotective, anti-diabetic potential of *A.hookeri*.

***Objective*:** To evaluate the preclinical nephroprotective efficacy of hydroalcoholic (70% ethanol) *A.hookeri* roots extract (HAAH) in the Cyclosporine-induced nephrotoxicity in validated rat model and to compare its effect with one of its constituent S-allylcysteine.

***Methods*:** Animals were divided into 6 groups comprises of five rats each (N = 5) and treated as follows: rats of group I, III and V injected with olive oil (1 ml/kg b.w.*s.c*), rats of Group II, IV and VI were challenged *subcutaneously* with cyclosporine (25 mg/kg in olive oil). Additionally, rats of group I and II were treated *perorally* with vehicle (carboxyl methyl cellulose, 0.3% w/v) which served as normal control and disease control, respectively. Moreover, rats of group III and IV were treated for 21 days with characterized HAAH at a dose of 200 mg/kg b.w.*p.o*. Whereas, rats of group V and VI were treated daily for 21 days with the equivalent dose of one active constituents i.e. s-allylcysteine (200 µg/kg b.w.*p.o*) followed by blood collection, scarification, and organ collection for assessment of nephrotoxicity parameters.

***Result and Conclusion*:** Treatment of rats with HAAH and s-allylcysteine caused a statistically significant ($p<0.05$) nephroprotection against Cyclosporine-induced nephrotoxicity in rats which is evident by assessing parameters *viz.*, creatinine, uric acid, urea, histopathology, and oxidative stress markers. Further, nephroprotective effect of HAAH was more pronounced than that of S-allylcysteine alone highlighting the synergistic effects of other constituents of *A.hookeri* rather than s-allylcysteine alone.

Keywords: *Allium hookeri*, Nephrotoxicity, S-allylcysteine, Cyclosporine

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A HOLISTIC AND TRANSLATIONAL PRECLINICAL COMPUTATIONAL FRAMEWORK: NETWORK-DRIVEN DYNAMIC TARGET ENGAGEMENT AND VALIDATION OF *Allium hookeri* IN DIABESITY

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ABSTRACT

***Background*:** Diabesity constitutes a systems-level metabolic pathology arising from coordinated disruptions in insulin signalling, immunometabolic inflammation, redox homeostasis, and energy regulation. Conventional single-target interventions inadequately address this networked disease architecture. *Allium hookeri*, a phytochemically complex medicinal species with emerging metabolic relevance, represents a plausible multi-target intervention. Integrative preclinical frameworks uniting network pharmacology, molecular docking, and protein dynamics enable mechanistic, systems-level interrogation of plant–disease interactions and translational hypothesis generation.

***Objective*:** To integrate a computational framework with *in vivo* validation to delineate the multi-target therapeutic mechanisms of *Allium hookeri* in diabesity.

***Methods*:** A preclinical, multiscale investigational paradigm integrating systems-oriented computational interrogation with organism-level validation was implemented. Disease-associated molecular architectures were delineated through network-centric target mapping, complemented by structure-guided interaction modelling and conformational adaptability analysis. Preventive *in vivo* evaluation employed a high-fat diet, Triton WR-1339, and streptozotocin-induced diabesity model in Swiss albino mice (n = 6/group). Six experimental cohorts encompassing physiological controls, pharmacological comparators, and *Allium hookeri* intervention were assessed. Longitudinal phenotyping included body-weight dynamics and interval-based fasting glycemia, while terminal analyses comprised serum biochemical parameters and histomorphological evaluation of metabolically relevant tissues. Statistical analysis was performed using one-way ANOVA ($p < 0.05$).

***Results*:** Computational analysis revealed an interconnected molecular network implicating key regulatory nodes governing metabolic, inflammatory, and redox pathways. Molecular interaction modelling and conformational flexibility profiling supported stable and biologically plausible target engagement. Preventive *Allium hookeri* intervention significantly modulated body-weight trajectories, fasting glycaemic status, biochemical parameters, and tissue histomorphology, demonstrating concordance between computational predictions and *in vivo* outcomes.

***Conclusion*:** This study establishes a holistic, preclinical, and translational framework integrating systems-level computation with experimental validation to elucidate the multi-target therapeutic mechanisms of *Allium hookeri* in diabesity. The findings highlight the value of integrative strategies for complex metabolic disorders and provide a rational basis for future translational advancement.

Keywords: Systems Pharmacology, Diabesity, Network Pharmacology, Preclinical Translational Research

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WOUND HEALING ACTIVITY OF EXTRACTS FROM THE WHOLE PLANT OF *Hydrocotyle sibthorpioides*

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ABSTRACT

Background: *Hydrocotyle sibthorpioides* is traditionally used for skin ailments, but integrated experimental and mechanistic evidence supporting its wound healing potential remains limited.

Objective: To evaluate the wound healing efficacy and safety of *H. sibthorpioides* extracts, formulate a topical gel using the most active extract, and explore plausible molecular interactions of major phytocompounds with wound healing–related targets.

Methods: Hexane, ethyl acetate, aqueous, and methanolic extracts were prepared and screened for phytoconstituents and *in vitro* antioxidant activity. Based on prior evidence and preliminary screening, the methanolic extract (MEH) was prioritized for further evaluation, including acute toxicity and *in vitro* cytotoxicity assessment. MEH was incorporated into topical gels (0.2% and 0.5%) and evaluated in Albino Wistar rats using an excision wound model, with a standard control (silver nitrate). Wound closure (%) and epithelialization time were quantified, and skin tissues were examined histopathologically. For *in silico* analysis, MEH was profiled by HR-LCMS, abundant phytocompounds were subjected to drug-likeness screening, and selected compounds were docked with COX-2, interleukin-1, TGF-β, and TNF.

Results: Phytochemical screening indicated the presence of multiple constituents, including flavonoids, supporting antioxidant and wound repair potential. MEH demonstrated the highest antioxidant activity among the tested extracts and showed acceptable safety in acute toxicity and cytotoxicity evaluations. MEH-loaded gels produced significant wound healing effects ($p < 0.05$), with faster wound contraction, improved wound closure, and reduced epithelialization time versus controls. Histopathology corroborated enhanced re-epithelialization and improved tissue repair in treated groups ($p < 0.05$). Docking suggested favorable binding of selected phytocompounds across the evaluated wound healing–associated targets.

Conclusion: MEH of *H. sibthorpioides*, particularly as a topical gel, promotes significant wound healing in rats, and major phytocompounds show supportive *in silico* interactions with key inflammatory and repair pathways.

Keywords: *Hydrocotyle sibthorpioides*, Wound healing, Phytocompounds

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PHARMACOGNOSTIC ANALYSIS AND PHARMACOLOGICAL ASSESSMENT OF POTENTIAL OF *Vachellia farnesiana* (L.) WIGHT & ARN. BARK EXTRACT IN WOUND HEALING

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ABSTRACT

Background: For generations, traditional medicine has used *Vachellia farnesiana* (L). Wright & Arn., also referred to as Sweet Acacia. It is used to cure lung congestion, skin disorders and inflammatory problems, according to ethnopharmacological data. There is still a lack of a thorough assessment of its phytochemical outline and pharmacological effectiveness employing contemporary process optimization, despite its recorded usage in conventional wound treatment.

Objectives: This study sought to assess *V. farnesiana's* capacity of wound healing as well as conduct a thorough pharmacognostic and phytochemical analysis of the plant. The study's main objectives were to measure secondary metabolites, optimize the extraction procedure using Design-Expert software and confirm the therapeutic effectiveness using histological analysis and an *in vivo* excision wound model.

Methods: Standard techniques were followed I the first screening of phytochemicals and pharmacognostic parameters. Design-Expert software was used to optimize and evaluate the extraction. The presence of phenols, flavonoids and alkaloids was measured using qualitative analysis. An *in vivo* excision wound model was used in Wistar rats for pharmacological assessment and the regenerated skin was then examined histopathologically.

Results: Alkaloids, phenols, flavonoids, tannins and other compounds were identified by phytochemical screening. The optimized extraction process yielded a high concentration of bioactive compounds, with TPC and TFC showing a strong correlation with antioxidant and healing activities. In comparison to the control group, the V. farnesiana treated group in the excision wound model showed a much higher rate of wound contraction and a shorter epithelization duration. Histopathological examination of the treated participants showed reduced inflammatory cell infiltration, ordered tissue regeneration and increased collagen production.

Conclusion: The results indicate that the *V. farnesiana* extract has strong wound healing capabilities, which are probably mediated by its high phenolic as well as flavonoid content. This study establishes *V. farnesiana* as a viable choice for the development of natural wound-healing products and offers scientific support for its traditional use.

Keywords: *Vachellia farnesiana*, Bark extract, Wound-healing

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TRADITIONAL TREATMENT OF CUTANEOUS LEISHMANIASIS IN OCHOLLO, A HOTSPOT IN SOUTHERN ETHIOPIA

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ABSTRACT

***Background*:** Cutaneous leishmaniasis (CL) remains a significant public health problem, particularly in endemic rural areas of Ethiopia, where access to modern treatment is limited. In these regions, it is largely treated by traditional healers. Although Ochollo is one of the oldest and most studied CL hotspots in the country, traditional treatment practices used by healers have never been systematically documented.

***Objective*:** This study aimed to identify and document treatment practices utilized by traditional healers to treat cutaneous leishmaniasis in Ochollo village, South Ethiopia.

***Methods*:** An ethnobotanical survey was conducted between September 2023 and January 2024 using semi-structured interviews and guided field observations. 31 traditional healers were purposively selected. Medicinal plants were collected for botanical identification. The relative frequency of citation (RFC) was calculated to determine the popularity and relative importance of each reported plant species. A literature review was also conducted to assess the scientific evidence supporting the antileishmanial activity of the identified plants.

***Results and Conclusion*:** Twenty-three medicinal plant species belonging to seventeen different families were reported to be effective for cutaneous leishmaniasis. The most commonly used plant family was Asteraceae (17.4%), followed by Ranunculaceae (8.7%). The most frequently cited species were *Clematis simensis* Fresen (RFC=0.23), *Acmella caulirhiza* Del. (RFC=0.19), and *Ranunculus multifidus* Forssk (RFC=0.16). Leaves were the most commonly used plant part (69.6%), and all the remedies were applied topically. Besides herbal remedies, traditional healers also used thermotherapy, either alone or in combination with plant-based treatments. Despite the widespread use of traditional remedies, scientific validation remains limited for most of the identified plants. It is, therefore, important to scientifically validate these traditional treatment methods, particularly the identified medicinal plants of the area, to develop safe and effective antileishmanial agents.

Keywords*:* Antileishmanial activity, Traditional medicine, *Cutaneous Leishmaniasis*, Ethiopia.

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MECHANISTIC INSIGHTS INTO THE ANTI-ACUTE LUNG INJURY (ALI) POTENTIAL OF AN OPTIMIZED POLY-HERBAL FORMULATION VIA DOCKING AND MOLECULAR DYNAMIC SIMULATION

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ABSTRACT

***Background*:** A Poly-Herbal Formulation (PHF) constituted by barks of *Azadirachta indica*, seeds of *Caesalpinia bonduc*, roots of *Solanum spirale* and rhizomes of *Cyperus rotundus* grinded together in the ratio 1: 0.3: 1: 1 prescribed by traditional healers for treatment of pneumonia was subjected to authentic scientific validation involving molecular docking and dynamic simulation studies.

***Objectives*:** *In silico* elucidation of the Anti-ALI Potential of an optimized PHF involving Docking and Molecular Dynamics Simulation.

Methods: LC-MS analysis of the formulation was carried out involving Electrospray Ionization (ESI) while predictive metabolites corresponding to each retention time was determined using Mass Bank database (https://massbank.eu/MassBank/) while potent compounds with anti-ALI, anti-inflammatory, anti-viral properties were subjected to drug likeliness evaluation (ADME) using SWISS ADME (https://www.swissadme.ch/). Phyto-compounds with zero violation of the drug likeliness rules were subjected to molecular docking involving ALI specific biomarker proteins like iNOS, COX2 and SAA3 using Pyrx 0.8. Furthermore, best docked interaction (lowest B.E) were subjected to molecular dynamic simulation using GROMACS 2020 over a duration of 200 ns.

***Results and Conclusion*:** A total of 17 phyto-compounds were detected in LC-MS analysis, most of which possess therapeutic properties while few compounds like lapidin, aconitine, vitexin-2-O-rhamnoside, rhoifolin, podophyllotoxin, daidzein-8-C-glucoside, apigenin-6-C-glucoside, and kaempferol-3-O- rutinoside with anti-ALI, anti-inflammatory, anti-viral properties might have attributed PHF its ameliorative property. ADME analysis revealed lapidin and podophyllotoxin as potent drug likeliness candidate and as such docking study revealed the order of binding for lapidin as SAA3 (-8.4 kcal/mol) < INOS (-7.6 kcal/mol) < COX2 (-7.1 kcal/mol) while for podophyllotoxin, the order is as follows: iNOS (-9 kcal/mol) < SAA3 (-8.5 kcal/mol) < COX-2 (-7.5 kcal/mol) while simulation studies revealed that Lapidin–COX2 and Lapidin–SAA3 complexes remain structurally stable and dynamically supportive throughout the 200 ns simulation. PHF exhibits marked therapeutic efficacy in LPS-induced ALI owing to the presence of therapeutically significant phyto-compounds.

Keywords: Acute lung injury, Poly-herbal formulation, ADME, Molecular dynamic simulation.

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ARTIFICIAL INTELLIGENCE IN NATURAL DISASTER PREDICTION AND MANAGEMENT

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ABSTRACT

Background: Natural disasters such as floods, wildfires, landslides, and droughts are increasing in frequency and intensity due to climate change and rapid environmental degradation. These disasters cause significant loss of life, damage to infrastructure, and disruption of ecosystems. Traditional disaster monitoring and prediction systems often face limitations in processing large environmental datasets and providing timely warnings. In this context, Artificial Intelligence (AI) has emerged as a promising approach to enhance disaster prediction, monitoring, and management through advanced data analysis and predictive modeling.

Objective: The objective of this study is to explore the role of Artificial Intelligence in improving natural disaster prediction and management, with a focus on predicting floods, wildfires, landslides, and droughts, as well as strengthening early warning systems and disaster risk assessment.

Methods: The study is based on the analysis of secondary data from scientific literature, environmental databases, and case studies on AI applications in disaster management. Various AI techniques, including machine learning, deep learning, and remote sensing analysis, are examined to understand their effectiveness in detecting patterns, forecasting disasters, and supporting real-time environmental monitoring.

Results and Conclusion: The findings indicate that AI-based models significantly improve the accuracy and efficiency of predicting natural disasters by analyzing large volumes of climatic and geographical data. AI also enhances early warning systems by providing timely alerts and helps in disaster risk assessment by identifying vulnerable regions and estimating potential impacts. Although challenges such as data quality, computational requirements, and technical expertise remain, the integration of AI with environmental monitoring systems can greatly strengthen disaster preparedness and response strategies. Therefore, AI-driven approaches play a crucial role in reducing disaster risks and promoting sustainable disaster management.

Keywords: Artificial Intelligence; Natural Disaster; Flood Forecasting; Wildfire Detection; Disaster Risk Assessment.

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COMPUTATIONAL SCREENING AND MOLECULAR DYNAMICS SIMULATION OF NOVEL 3,5-SUBSTITUTED THIAZOLIDINEDIONE DERIVATIVES FOR ANTIDIABETIC POTENTIAL

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ABSTRACT

***Background*:** Type II Diabetes is a multifactorial metabolic disorder characterized by insulin resistance and chronic hyperglycemia. This study aims to develop novel 3,5-substituted thiazolidinedione (TZD) derivatives as potent insulin-sensitizing agents. By targeting the PPARγ receptor (PDB ID: 2PRG), we utilized a pharmacophore hybridization approach to design molecules with superior binding affinity.

Objective: The objective is to design and evaluate novel 3,5-substituted thiazolidinedione derivatives as potent PPARγ agonists for Type II Diabetes. Utilizing pharmacophore hybridization, the study aims to identify candidates with high binding affinity for the 2PRG protein while optimizing pharmacokinetic and safety profiles. The research prioritizes lead compounds with strong structural stability through integrated network pharmacology and molecular dynamics simulations

***Methods*:** A library of 100 novel TZD derivatives was subjected to comprehensive computational screening, including pharmacokinetic (ADMET) and toxicity studies to ensure drug-likeness and safety. Network pharmacology was employed to map the systemic interactions of these derivatives, followed by molecular docking against the 2PRG protein to determine binding orientations. The stability of the lead protein-ligand complexes was further validated through molecular dynamics simulations.

***Results and Conclusion*:** Screening identified high-affinity candidates with favourable safety profiles and strong hydrogen-bonding networks within the 2PRG active site. ADMET profiling confirmed high gastrointestinal absorption and minimal toxicity risks. Furthermore, molecular dynamics simulations demonstrated that the lead complex remained stable with minimal RMSD fluctuations throughout the trajectory. The *in silico* evaluation identified high-affinity candidates with favourable safety profiles and strong hydrogen-bonding networks within the 2PRG active site. Molecular dynamics simulations confirmed that the lead compounds maintained structural integrity and stable trajectories throughout the simulation period. These findings suggest that 3,5-substituted thiazolidinediones are promising scaffolds for the development of next-generation antidiabetic therapies.

Keywords: Type 2 Diabetes, Thiazolidinedione, PPARγ, 2PRG, Molecular Dockin, Molecular Dynamics.

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DRUG REPURPOSING OF A GUT SELECTIVE ANTIBIOTIC FOR RHEUMATOID ARTHRITIS: AN INTEGRATED *IN SILICO* AND *IN VIVO* STUDY

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ABSTRACT

***Background*:** Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disorder characterized by persistent synovial inflammation, oxidative stress and progressive joint destruction. Increasing evidence highlights the involvement of gut dysbiosis and the gut–joint axis in RA pathogenesis. Network pharmacology provides a systems-based strategy for drug repurposing by identifying multi-target interactions and pathway modulation.

***Objective*:** This study aimed to repurpose gut selective antibiotic for Rheumatoid Arthritis using an integrated approach combining network pharmacology, molecular docking and *in vivo* validation.

***Methods*:** Potential targets of Gut selective antibiotic were predicted using Swiss Target Prediction. RA and IBS related targets were retrieved from Gene Cards, and overlapping targets were identified. Protein–protein interaction (PPI) networks were constructed using STRING and analyzed in Cytoscape to identify hub genes. Gene Ontology (GO) and KEGG pathway enrichment analyses were performed using ShinyGO. Molecular docking was conducted using Auto Dock Vina against key inflammatory targets including COX-2, TNF-α, β-catenin, AKT1, and iNOS. *In vivo* antioxidant (DPPH, ABTS, H_2O_2 scavenging) and anti-inflammatory (protein denaturation and HRBC membrane stabilization) assays were performed.

***Results and Conclusion*:** Network pharmacology identified crucial overlapping therapeutic targets which emphasized the role of gut-joint axis in Rheumatoid arthritis. Molecular docking showed positive interactions between the tested compound and selected inflammatory proteins. The *in vivo* antioxidant and anti-inflammatory tests showed a concentration-dependent effect supporting the predicted multi-target therapeutic potential. These preliminary findings suggest that Gut selective antibiotic exerts multi-target antioxidant and anti-inflammatory effects through modulation of key inflammatory pathways supporting its potential repurposing for RA.

Keywords: Rheumatoid arthritis, Gut-Joint axis, *In silico* Studies, *In vivo* Studies

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EVALUATION OF PHARMACOLOGICAL ACTIVITY OF *Campylandra aurantiaca* Baker: A PLANT USED BY ETHNIC TRIBES OF NORTHEAST INDIA

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ABSTRACT

***Background*:** Arthritis is a chronic inflammatory disease and is among the oldest diseases described around 18th century. Rheumatoid arthritis (RA) affected about 62.35 million of people in 2019 and globally around 1-2% of the total population. In this study, based on the ethnobotanical values, field study with the traditional healers and after extensive literature review the plant species *Campylandra aurantiaca* Baker (Asparagaceae) is choosen for evaluating the potential pharmacological activity.

***Objective*:** The aim of this study is to evaluate the potential pharmacological activity of *Campylandra aurantiaca* Baker through *in silico*, *in vivo* and *in vivo* study.

***Methods*:** A field survey for collecting information about the plant species was done with the traditional healers from the different areas of Assam and Meghalaya after collecting information from literature review. The plant was collected and authenticated at BSI, Shillong. Whole parts of the plant were washed, shade dried and pulverized mechanically and packed in an air tight container. The powder of the plant was extracted successively by using soxhlet extraction techniques using different solvents. The obtained extracts were screened for phytochemicals analysis. Network analysis and molecular docking for identifying the potent active compounds were done. *In vivo* anti-inflammatory analysis and further *in vivo* analysis were carried out.

***Results and Conclusion*:** The powdered sample of the plant was extracted by successive extraction technique using different solvents. The anti-oxidant activity showed the plant extract ability to scavenge the free radicals including DPPH and free radical. The result obtained from the *in vivo* anti-inflammatory study showed potent activity of the plant extract which was further confirmed by the *in vivo* activity. This above study confirms the ethnomedicinal value of *Campylandra aurantiaca* Baker in the treatment of rheumatoid arthritis. Further study into the molecular level is required to confirm its effectiveness and establish it as a potent compound for clinical study.

Keywords: Ethnomedicinal Plant, Extraction, Inflammation, *In Silico*, *In Vivo* Study

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IN-SILICO DESIGN, SYNTHESIS FOR ANTI-ALZHEIMER ACTIVITY OF S-TRIAZINE DERIVATIVES

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ABSTRACT

***Background*:** Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline, memory impairment, and cholinergic dysfunction. The reduction in acetylcholine levels due to increased activity of acetylcholinesterase (AChE) and butyrylcholinesterase (BuChE) plays a critical role in disease progression. Although currently available cholinesterase inhibitors provide symptomatic relief, their clinical utility is limited by modest efficacy, short-term benefits, and adverse effects. Therefore, the development of novel therapeutic agents with improved efficacy and safety profiles remains an urgent need. Recent advances in medicinal chemistry have identified s-triazine derivatives as promising pharmacophores due to their structural versatility and potential to act as multi-target-directed ligands. Several studies have reported their ability to inhibit cholinesterase enzymes, suggesting their potential as anti-Alzheimer agents.

Objective: The present study aims to design, synthesize, and biologically evaluate novel s-triazine-based derivatives as potential anti-Alzheimer agents using an integrated computational and experimental approach. Molecular docking studies was performed to identify promising candidates with favourable binding affinity and drug-likeness properties. Selected compounds were synthesized, structurally characterized, and evaluated through in vitro cholinesterase inhibition assays to identify potent lead molecules with improved inhibitory activity and pharmacological potential.

Method: For the *In- silico* studies, at first library of 427 compound were prepared with the help of chem draw 16 professional software. Initially, Lipinski was evaluated with the help of SWISS ADME software followed by ADME and Toxicity which was done in Discovery Studio Visualizer. From the Protein Data Bank protein was downloaded having PDB ID (1EVE). Further docking was done of passed compounds (48) by using Discovery Studio software.

Results and Conclusion: Ten compounds (A2, A3, C2, D3, G2, G3, G4, G25, G36, G47) demonstrated superior binding affinities (–385.536 to –545.982 kcal/mol) compared to Donepezil (–278.983 kcal/mol). These findings identify s-triazine derivatives as promising lead candidates were synthesis and biological evaluation for anti-Alzheimer activity.

Keywords: Alzheimer's disease, s-Triazine derivatives, Cholinesterase inhibition, Molecular docking, Drug discovery

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CARDIOMETABOLIC IMPLICATIONS OF RISING PALM OIL CONSUMPTION IN INDIA: A NUTRITIONAL AND PUBLIC HEALTH PERSPECTIVE

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ABSTRACT

***Background*:** To evaluate the cardiometabolic implications of India's escalating palm oil consumption—rising from 8 kg/year per capita in the early 2000s to nearly 24 kg/year by 2025—which coincides with a burgeoning epidemic of non-communicable diseases (NCDs) such as type 2 diabetes and hypertensive heart disease.

***Objective*:** To understand how this heavy reliance on palm oil impacts heart health, especially given the alarming rise of early heart attacks across the country.

***Method*:** This review synthesizes scientific evidence published between 2015 and 2025, comparing the cardiometabolic effects of palm oil intake against indigenous unsaturated oils, such as mustard, sunflower, and rice bran oil, specifically within the context of the South Asian demographic.

***Result*:** Palm oil is nearly 50% saturated fat, which directly raises "bad" cholesterol (LDL) and overall heart risk. Because of Indian body types, people in this region are especially vulnerable to the harmful effects of these unhealthy fats. Today's fast-paced lifestyles have led people to rely heavily on packaged, ready-to-eat foods where refined palm oil is a cheap, hidden ingredient. The high heat used to process this oil destroys any natural nutrients it originally had. By replacing traditional, nutrient-rich oils with palm oil in everyday snacks and meals, we are seeing a frightening increase in early heart attacks, especially among younger Indians.

***Conclusion*:** The shift toward palm oil is a major, yet preventable, public health threat. To lower the risk of heart disease in India, we urgently need clear warning labels on packaged foods, better support for producing local traditional oils, and stronger campaigns to encourage people to use a healthier variety of cooking oils in their daily lives.

Keywords: Palm oil, LDL cholesterol, Cardiometabolic risk, Nutritional transition.

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IN SILICO DESIGN, SYNTHESIS AND CHARACTERIZATION OF SOME SERIES OF BENZOXANTHONE DERIVATIVES AS HUMAN TOPOISOMERASE 2*α* ATPase INHIBITORS

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ABSTRACT

***Background*:** Benzoxanthone derivatives represent an important class of heterocyclic compounds that have attracted attention in medicinal chemistry due to their diverse structural features and reported biological relevance. Computational approaches are increasingly used in early drug discovery to design chemical libraries and evaluate their pharmacokinetic and toxicity profiles before experimental studies.

***Objective*:** The present study aimed to design a library of benzoxanthone derivatives and evaluate their drug-likeness, toxicity profile, and potential biological targets using computational tools, followed by synthesis and structural characterization of selected compounds.

***Methods*:** A virtual library of benzoxanthone derivatives was designed by introducing fifteen different substituents at seven possible positions while varying the alkyl chain length from C1-C5. The physicochemical and pharmacokinetic properties of the compounds were evaluated using DataWarrior (v06.01.00). Drug-likeness and violations of Lipinski's Rule of Five were analyzed using the SwissADME web server, while toxicity profiles were predicted using ProTox-3.0. Compounds meeting the ADMET criteria were further analyzed through reverse pharmacophore mapping using the PharmMapper server to identify potential drug targets. Human Topoisomerase IIα ATPase/AMP-PNP (PDB ID: 1ZXM) was selected for docking studies. Electronic structure calculations were performed using density functional theory (DFT) with Gaussian 09. Molecular docking and molecular dynamics simulations were also carried out to examine ligand-target interactions. Selected derivatives were synthesized and characterized using spectroscopic techniques.

***Results*:** Among the 525 designed molecules, 245 compounds were found to comply with Lipinski's rule and exhibited comparatively lower predicted toxicity profiles. These ligands were subjected to further computational analyses. Reverse pharmacophore mapping suggested Human Topoisomerase IIα ATPase/AMP-PNP (1ZXM) as a potential target. Computational analyses including docking, molecular dynamics simulations, and density functional theory calculations were conducted to evaluate interaction patterns and molecular stability. Selected benzoxanthone derivatives were successfully synthesized, and spectroscopic characterization confirmed their structural integrity and purity.

Keywords: Human Topoisomerase IIα ATPase, Anti-cancer, Benzoxanthone, Molecular dynamics, DFT

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DEPRESSION-DRIVEN INFLAMMATORY REPROGRAMMING OF THE TUMOR MICROENVIRONMENT IN ADVANCED CANCER: A MULTI-CENTRIC PSYCHO-IMMUNO-TRANSCRIPTOMIC STUDY

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ABSTRACT

***Background*:** Depression is a common comorbidity in cancer patients and may exacerbate tumor progression through inflammatory remodelling of the tumor microenvironment (TME).

***Objective*:** This study explored the clinical, biochemical, and molecular interplay between depression, palliative care status, and TME dynamics.

***Methods*:** In this multicentric observational study, three cohorts were assessed: depression-only patients (n=30), palliative care patients with depression (n=30), and healthy controls (n=30). Standardized psychological tools (PHQ-9, DASS-Depression) measured distress. Plasma cytokines were quantified, TME activation scores calculated, and RNA sequencing performed to assess differential gene expression and pathway enrichment. Network analysis identified key molecular hubs.

***Results*:** Palliative-depression patients had the highest distress scores (PHQ-9: 20.1±4.2, DASS-Dep: 28.6±5.1) vs depression-only (18.3±3.8, 25.4±4.7) and controls (3.1±1.2, $p<0.01$). Cytokine profiling revealed a marked pro-inflammatory shift in palliative-depression (IL-6: 3.8×, TNF-α: 3.2×, VEGF: 2.9×) and suppression of protective cytokines (EGF: 0.4×, IL-10: 0.5× vs controls). TME activation scores rose progressively from controls (1.0) to depression (3.91) to palliative-depression (6.5), correlating with a 7-fold higher metastasis risk. RNA-seq identified 3,254 differentially expressed genes in palliative-depression, with enrichment in inflammatory response (NES=2.25), angiogenesis (VEGFA↑ 3.3×), and immune checkpoint dysregulation (PD-L1↑ 2.8×). IL-6 and TGF-β emerged as central network hubs.

***Conclusions*:** Depression, particularly in palliative care patients, is associated with graded pro-inflammatory and immunosuppressive TME reprogramming, elevated metastasis risk, and specific molecular signatures. Cytokine profiling and TME metrics may serve as biomarkers for cancer risk stratification and personalized palliative interventions in patients with comorbid depression.

Keywords: Cancer, Psycho-oncology, Depression, Cytokine

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COCONUT OIL/LAURIC ACID (CO/LA)-BASED NANODRUG FORMULATION FOR PROTECTING NORMAL CELLS FROM ANTICANCER DRUG-INDUCED TOXICITY: A PHARMACOLOGICAL STRATEGY FOR TRANSLATIONAL ONCOLOGY

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ABSTRACT

***Background*:** The therapeutic efficacy of conventional anticancer treatments such as chemotherapy is often limited by severe toxicity to normal cells, which reduces the overall therapeutic index of anticancer drugs. Platinum-based chemotherapeutic agents, including cisplatin and carboplatin, are widely used in cancer treatment but are associated with significant adverse effects, oxidative stress, and the development of drug resistance. Therefore, the development of novel strategies that can reduce chemotherapy-induced toxicity while maintaining anticancer efficacy is a major challenge in translational oncology. Natural lipid-based nanodrug delivery systems have emerged as promising approaches for improving drug safety and therapeutic outcomes.

***Objective*:** This study aims to explore the potential of coconut oil/lauric acid (CO/LA)-based nanodrug formulations as a pharmacological strategy to protect normal cells from anticancer drug-induced toxicity while enhancing therapeutic efficiency in cancer treatment.

***Methods*:** A comprehensive review and conceptual analysis of recent studies on coconut oil and lauric acid-based nanoformulations were conducted, focusing on their physicochemical properties, antioxidant potential, and pharmacological applications. Particular attention was given to lipid-based nanocarrier systems incorporating coconut oil or lauric acid for drug delivery, their role in reducing oxidative stress, improving pharmacokinetic behaviour, and minimizing systemic toxicity during chemotherapy.

***Results*:** CO, rich in medium-chain triglycerides and bioactive fatty acids such as LA, demonstrates significant antioxidant, anti-inflammatory, and potential anticancer properties. Evidence from recent studies suggests that coconut-derived extracts can reduce oxidative stress and suppress oncogenic signalling pathways, including the overexpression of the c-MYC proto-oncogene. When formulated into lipid-based nanodrug systems, these bioactive components may enhance drug stability, improve targeted delivery, and reduce chemotherapy-induced cellular damage in normal tissues.

***Conclusion*:** CO/LA-based nanodrug formulations represent a promising natural lipid-based platform for protecting normal cells from anticancer drug-induced toxicity. Such nanoformulations may enhance the safety and therapeutic efficiency of chemotherapy, offering a novel pharmacological strategy for the development of safer and more effective translational cancer therapies.

Keywords: Lauric Acid Nanodrug, Coconut Oil-Based Nanocarriers, Chemotherapy-Induced Toxicity, Translational Oncology

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PAST, PRESENT, AND FUTURE PERSPECTIVES OF PLANT-DERIVED ANTIMALARIAL DRUGS: A NARRATIVE REVIEW

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ABSTRACT

Background: Malaria remains a major global health burden, particularly in tropical and subtropical regions, despite substantial progress in prevention and treatment. The emergence and spread of Plasmodium falciparum resistance to artemisinin-based combination therapies (ACTs) in Southeast Asia and parts of Africa threaten to reverse decades of achievements in malaria control. Historically, plants have been a vital source of antimalarial agents, notably quinine and artemisinin, underscoring their continued relevance in drug discovery.

***Objective*:** This narrative review aims to analyze current evidence on plant-derived antimalarial agents, highlighting their historical significance, present status, and future potential in addressing drug-resistant malaria.

***Methods*:** A narrative review was conducted to assess published studies from 2020 to 2026 focusing on plant-derived antimalarial compounds. This review focuses on major classes of phytochemicals with antiplasmodial activity, including alkaloids, terpenoids, and other non-alkaloidal natural products. Ethnopharmacological approaches to drug discovery were critically evaluated, along with the role of traditional herbal medicines in malaria-endemic regions. Emerging strategies such as semi-synthetic derivatives, combination therapies, and the integration of computational and biotechnological tools were also explored.

Results and Conclusion: Plant-derived compounds continue to demonstrate significant antiplasmodial activity, offering promising leads for novel therapeutics. Alkaloids and terpenoids remain central to antimalarial drug development, while other natural products provide additional chemical diversity. Ethnopharmacological knowledge has contributed to the identification of bioactive compounds, particularly in Africa and Asian countries where traditional herbal medicines play a key role in primary healthcare. Innovative strategies, including structural modification of natural compounds and advanced screening technologies, enhance the potential for overcoming emerging drug resistance. Plant-derived antimalarials remain a critical resource in the fight against malaria. Integrating traditional knowledge with modern scientific tools may accelerate the development of next generation therapies capable of addressing the growing challenge of antimalarial drug resistance.

Keywords: Drug resistance, Malaria, Plasmodium falciparum, Plant-derived antimalarial compounds

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EVALUATION OF WOUND HEALING POTENTIAL OF BIOCOMPATIBLE DNA BASED DRUG-LOADED HYDROGEL FOR THE TREATMENT OF WOUND

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ABSTRACT

Background: DNA-based hydrogel have emerged as a novel class of biomaterials having intrinsic biocompatibility, programmability and ability to form well-defined three-dimensional networks through specific base-pair interactions. The unique molecular recognition and self-assembly properties of DNA enable precise control over hydrogel architecture and functionality, making them highly attractive for biomedical applications, however, through evaluation of their in vivo biocompatibility, toxicity and tissue response is essential to establish their translational potential.

Objective: The objective of this study was to develop a DNA-based hydrogel formulation and systematically investigate its physicochemical characteristics, biocompatibility, in vivo safety, and tissue interaction through comprehensive characterization, toxicity assessment, animal studies, and histopathological evaluation.

Methodology**:** A DNA-based hydrogel was formulated through controlled self-assembly of DNA building block under suitable physiological conditions. The hydrogel was characterized for its physicochemical properties and In vitro toxicity studies were conducted to evaluate cytocompatibility. The in vivo biocompatibility and safety of the DNA hydrogel were assessed using an appropriate animal model following implantation. Tissue samples were collected at predetermined time points and subjected to histopathological analysis. Hematoxylin and eosin (H&E) staining was performed to assess tissue morphology, inflammatory response, and cellular infiltration, while collagen staining was used to evaluate extracellular matrix deposition and tissue remodelling.

Results**:** The DNA-based hydrogel demonstrated successful gel formation with suitable physicochemical properties for biological applications. Toxicity studies indicated minimal cytotoxicity, confirming the biocompatible nature of the hydrogel. In vivo evaluation showed good tissue tolerance with no evidence of severe inflammation or necrosis. Histological examination of H&E-stained sections revealed preserved tissue architecture and minimal inflammatory cell infiltration. Collagen staining showed enhanced and organized collagen deposition in tissues treated with the DNA hydrogel, indicating effective extracellular matrix remodelling and positive tissue integration.

Conclusion**:** The findings of this study confirm that the DNA-based hydrogel is a biocompatible and non-toxic biomaterial with a favourable in vivo tissue response. The observed histopathological outcomes, including minimal inflammatory reaction and improved collagen organization, highlight the potential of DNA-based hydrogels for applications in wound healing and regenerative medicine.

Keywords: DNA-based hydrogel, Self-assembly, Biomaterials, Biocompatibility, *In-vivo* evaluation, Histopathology, Collagen deposition, Wound healing

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MICROBIOTA-MEDIATED MODULATION OF CISPLATIN EFFICACY: DRIVING AGGRESSIVENESS IN HEAD AND NECK SQUAMOUS CELL CARCINOMA

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ABSTRACT

***Background*:** Cisplatin-based chemotherapy remains a cornerstone for treating Head and Neck Squamous Cell Carcinoma (HNSCC). However, its therapeutic success is often limited in patients with advanced-stage disease (Stage III–IIIb). Emerging evidence indicates that chemotherapy itself may induce or select for aggressive, therapy-resistant tumour phenotypes. Meanwhile, dysbiosis of the oral microbiota—particularly involving *Fusobacterium nucleatum* and *Porphyromonas gingivalis*—has been implicated in HNSCC progression and immune evasion. Yet, the synergistic interplay between cisplatin treatment and oral microbial ecology remains poorly understood. Here, we investigate whether oral microbiota enhance cisplatin-induced aggressiveness via reprogramming of cancer stem cell (CSC) phenotypes, particularly the Tumour Stemness Defence (TSD) state, which represents an adaptive altruistic response to therapy-induced stress.

***Objective*:** The objective of this study is to investigate whether oral microbiota synergistically enhances cisplatin-induced aggressiveness in HNSCC by reprogramming cancer cells into a therapy-resistant Tumour Stemness Defence (TSD) state.

***Methods*:** Saliva samples were prospectively collected from 15 HNSCC patients prior to initiation of cisplatin-based chemotherapy. The microbiome composition was analyzed using 16S rRNA gene sequencing and targeted qPCR for *F. nucleatum* and *P. gingivalis*. In vitro, these isolates were co-cultured with SAS HNSCC cells (MOI 50:1) and treated with cisplatin (1–5 μM) for three days. Post-treatment recovery was monitored up to 14 days, with assessments of colony formation, migration, and expression of TSD-associated stemness markers (EpCAM, ABCG2, HIF-2α, Myc, SOX2, OCT4, NANOG). Clinically, post-therapy salivary microbiota was correlated with patient outcomes and tumour hypoxia profiles.

***Results*:** Co-exposure of SAS cells to cisplatin and *F. nucleatum* or *P. gingivalis* led to the emergence of a TSD-like phenotype, characterized by elevated expression of HIF-2α, ABCG2, and Myc, increased clonogenic survival, and enhanced migration capacity. This reprogramming effect was attenuated by TLR4 inhibition. Patient saliva analysis revealed that elevated microbial LPS load and enrichment of F. nucleatum correlated with poor chemotherapy response and higher CTC count during treatment.

Conclusion: Our findings reveal that the oral microbiota synergises with cisplatin to promote therapy-induced adaptive stemness in HNSCC. This mechanism, involving microbial LPS/TLR4 signalling and HIF-2α activation, suggests that oral microbial dysbiosis may act as a co-driver of tumour evolution under chemotherapeutic stress. Targeting microbiota–chemotherapy interactions may offer a new avenue to reduce post-therapy relapse.

Keywords: Tumour Stemness Defence, Head and Neck Squamous cell Carcinoma, Oral Microbiota

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INDIGENOUS KNOWLEDGE SYSTEMS (IKS) BASED MODEL FOR EFFECTIVE CANCER CARE IN RURAL ASSAM

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ABSTRACT

***Objective*:** The objective of this study is to have a medical humanities perspective in Bio-social healing of ancient Kamrupa by Community based participatory action research (CBPAR) for the effective rural healthcare**.**

***Background*:** Through a three decades of community based participatory action research (CBPAR) (Ref.1), we are studying cancer disparity. Since 2010, the "KaviKrishna Satra" program has developed a long-term cancer disparity research platform through an Indigenous Knowledge System (IKS)-based social-network framework (Ref.2) and using ethnography + phenomenology (Ref. 3), plus pancha-padika education (1-2). We are developing a digital IKS-based intervention (KaviKrishna HealArt App + Nigudah Yoga + nutrition + Focussed group discussions/FGDs) and a biosocial resilience scale (Sahasa-Ojash) rooted in Vedic Jiva Upakara Cikitsha Tantra, an Avatar-Kosha-based biosocial healing system (Ref. 1 & 4). We hypothesize that cancer disparity in rural India is a biosocial phenomenon that can be reduced by combining IKS-based communication systems, digital health connectivity, and psychosocial care.

***Methods*:** We mapped the social-support networks of 200 rural cancer patients through home visits, interviews, FGDs, and clinician-interaction analysis to detect the emergence of an IKS-based communication system through CBPAR. We measured Sahasa-Ojash in the first 35 patients, and will longitudinally measure all 200 patients through the Heal-Art app for continuous biosocial analytics. We also evaluated the continuity of care (adherence to scheduled follow-ups, completion of treatment, and persistence in telemedicine contact over 12 months).

***Results*:** The integrated digital-IKS intervention produced measurable biosocial and clinical impact: 1) Sahasa-Ojash increased 2-3-fold after the intervention (mean increase, $p = 0.065$, trend toward significance due to sample size). 2) Fatigue and insomnia reduced by 35-45% ($p = 0.046$), whereas appetite increased by 50-60% ($p = 0.032$). 3) Treatment adherence and follow-up continuity increased 3-fold through the KaviKrishna HealArt App. 4) Preliminary IKS-network analysis showed reactivation of indigenous social-communication pathways resembling historical IKIN structures, improving patient navigation and trust. 5) Patients reported greater psychological resilience, enhanced self-care, and improved communication with oncologists. 6) Clinical co-morbidities decreased (anemia, hypertension fluctuations, and GI disturbances). These biosocial gains correlated with a 3-fold improvement in continuity of care, greater chemotherapy completion, and markedly reduced treatment dropout.

***Conclusion*:** We have developed a unified, scalable, and cost-effective IKS-integrated cancer disparity model that Maps biosocial determinants using ethnography and phenomenology. (1). https://doi.org/10.1158/1538-7445.AM2024-1005 (2). https://doi.org/10.1158/1538-7445.AM2019-3342 (3). https://doi.org/10.1158/1538-7445.AM2024-807 (4). https://zenodo.org/records/8062404

Keywords: Indigenous, Cancer Disparity, IKS

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Curcuma caesia ROXB.: A NATURAL MODULATOR OF INFLAMMATORY AND OXIDATIVE STRESS SIGNALLING

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ABSTRACT

***Background*:** Oxidative stress is a major contributor to chronic inflammatory disorders. *Curcuma caesia* Roxb. (Black Turmeric), widely used in traditional medicine, possesses diverse therapeutic properties, however, its molecular mechanisms remain insufficiently understood.

***Objective*:** The current study investigated the antioxidant and anti-inflammatory properties of *C. caesia* Roxb rhizome methanolic extract (CCM), along with comprehensive phytochemical profiling.

***Methods*:** Phytochemical profiling of CCM was performed using UPLC-ESI-HRMS analysis. Molecular docking was conducted against key inflammatory and oxidative stress-related targets. *In vivo* efficacy was further validated using an LPS-induced sepsis model in Wistar rats.

Results and Conclusion: Phytochemical characterization tentatively annotated curcumenol, curzerenone, furanogerenone, and germacrone as major compounds and zederone as a minor trace constituent. Molecular docking scores ranged from -5.5 to -8.6 kcal/mol. In the *in vivo* study, levels of TNF-α, IL-6, ALT, AST, iNOS, and SOD were reduced, and IL-10 increased significantly at high doses. Overall, the methanolic extract of *Curcuma caesia* exhibits significant antioxidant and anti-inflammatory effects through the regulation of oxidative stress and inflammatory signalling pathways, supporting its potential for the management of oxidative stress-associated inflammatory disorders.

Keywords: *Curcuma caesia*, Oxidative stress, Inflammation, Antioxidant.

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NOVEL CARRIER BASED DRUG DELIVERY TO ENHANCE BLOOD BRAIN BARRIER PERMEABILITY FOR TREATMENT OF HEAD CARCINOMA VIA 22GS PROTEIN MODULATION

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ABSTRACT

***Background*:** In the present work novel benzophenone containing nitrogen mustard were designed, synthesized, characterized and evaluated for anticancer activity. Experts recognize that the effects of the medication on brain are limited due to lack of availability of drug caused by blood brain barrier's (BBB), it plays major role while developing drugs for brain distribution. One of the protein Human glutathione S transferases (22GS) is overexpressed in glioblastoma (GBM) and other brain cancers.

***Objective*:** Design, synthesis, characterization and evaluation for anticancer activity of some Novel benzophenone containing nitrogen mustard.

***Methods*:** The designed compounds were selected for synthesis on the basis of docking with protein Human glutathione S transferases 22GS, Density Functional Theory (DFT), and Molecular Dynamic (MD) simulation studies. Best docked compounds were synthesized in three steps i.e. a) preparation of 2-amino benzophenone b) preparation of nitrogen mustard and c) preparation of benzophenone containing nitrogen mustard. Synthesized compounds were characterized by nuclear magnetic resonance (NMR) spectroscopy, infrared spectroscopy (IR), thin-layer chromatography (TLC) and mass spectroscopy. Using a SRB assay anticancer activity, was evaluated using U87-MG cell line and antioxidant activity was determined by using DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging method.

***Result and conclusion*:** Significant anti-cancer activity and antioxidant activity were shown by all designed compounds compared with the Adriamycin as standard, however compound NMD-I was the most effective.

Keywords: WHO, Head carcinoma, Brain tumour, Human glutathione s transferase, glioblastoma, BBB

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DESIGN AND EVALUATION OF A BIOSURFACTANT–β-CRYPTOXANTHIN LOADED HYDROGEL FOR ANTIOXIDANT AND ANTIBACTERIAL TOPICAL DELIVERY

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ABSTRACT

***Background*:** Bio-polymer-based material can be suitable alternative carrier for topical delivery of bioactive compounds owing to their biocompatible, non-toxic property, and drug-loading capacity.

***Objective*:** The current study developed hydrogel by encapsulating two bioactive compounds namely biosurfactant (BS) and beta-cryptoxanthin (β-CRX) from Kocuria marina DAGII to explore its potential application as topical delivery system.

***Methods*:** Preliminary screening of BS using oil spreading assay, drop-collapse assay, and surface tension analysis confirmed its presence in cell free supernatant. Characterization study by TLC, FTIR, and MALDI-TOF revealed the presence of proteins, polysaccharides and lipids in BS.

Results and Conclusion: Antioxidant study showed good radical scavenging activity of β-CRX against DPPH and ABTS radicals with an IC_{50} value of 32.51±1.15 µg/ml and 41.91±0.33 µg/ml respectively. Meanwhile, BS showed good antimicrobial activity against three opportunistic bacterial pathogens *Pseudomonas aeruginosa* (0.766±0.05cm), *Staphylococcus epidermidis* (0.66±0.057 cm), and *Staphylococcus aureus* (0.13± 0.057 cm). Different concentrations of BS and β-CRX were further combined and encapsulated using (2:5) Sodium Alginate (SA): Gelatin (G) hydrogel to explore its potential application as topical delivery system. Spreadability study performed by encapsulating hydrogel with different combination of BS (16, 32) mg/ml and β-CRX (0.034, 0.1) mg/ml showed highest spreadability (153.86±0.62 mm^2) at 16 mg/ml of BS. Swelling study showed the good swelling activity of hydrogel loaded with BS and β-CRX. The pore size ranging from 40 µm-350 µm detected through FESEM analysis confirmed the suitability of hydrogel as candidate for drug encapsulation. *In vitro* release study of hydrogel loaded with BS and β-CRX showed maximum efficacy at pH 7.4 indicating that de-protonation of hydrogel is responsible for hydrogel swelling, and release. Formulated hydrogel showed antibacterial activity and antioxidant activity against radicals. Futhermore, hydrogel containing combination of BS and β-CRX showed non-hemolytic nature suggesting that this formulation could be further enhance to deliver bioactive compounds to target skin damage.

Keywords: Beta-cryptoxanthin, Biosurfactant, Antioxidant, Antibacterial, Hydrogel

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EFFECT OF *Acacia pennata* (L.) WILLD. LEAVES IN A DEXTRAN SULFATE SODIUM-INDUCED IRRITABLE BOWEL SYNDROME MODEL IN RATS

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ABSTRACT

***Background and Objective*:** *Acacia pennata* (L.) Willd. (Family: Mimosaceae), a traditional medicinal plant known for its anti-inflammatory, antioxidant, and antidiarrheal properties. This study evaluated the therapeutic potential of hydro-alcoholic extract of *A. pennata* leaves (HAAP) in a dextran sulfate sodium (DSS)-induced irritable bowel syndrome (IBS) model in rats.

Methods: Adult male Wistar rats were divided into four groups: Group I: Control group, Group II: DSS-induced IBS group, Group III: DSS + hydro-alcoholic extract of *Acacia pennata* leaves (HAAP, 300 mg/kg/day orally), and Group IV: DSS + Loperamide (10 mg/kg/day orally) as a standard group. IBS was induced by administering 0.5% DSS in drinking water for 5 days, followed by a 5-day recovery period. This cycle was repeated three times. Parameters assessed included Disease Activity Index (DAI), intestinal motility, colon length, histopathological changes, and oxidative stress markers.

***Results and Conclusion**:* Treatment with HAAP significantly ($p<0.05$) reduced DAI scores and improved intestinal motility compared to the DSS group. Colon length was significantly ($p<0.05$) preserved. Histopathological analysis showed reduced inflammatory cell infiltration, and oxidative stress markers were markedly improved. These findings indicate that HAAP alleviated DSS-induced IBS symptoms by reducing inflammation, restoring bowel function, and enhancing antioxidant defences. The results support the potential use of *A. pennata* as a phytotherapeutic agent for the management of IBS.

Keywords: *Acacia pennata*, irritable bowel syndrome, DSS-induced IBS, oxidative stress and inflammation

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BENEFICIAL EFFECT OF UNANI FORMULATION ON DEPRESSION IN MICE

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ABSTRACT

***Background*:** Traditional medicine encompasses indigenous knowledge and practices widely used for health maintenance and disease management, primarily based on plant-derived formulations. Chronic Unpredictable Mild Stress (CUMS) is a well-established animal model that mimics human chronic stress and depression by inducing depressive-like behaviors, cognitive impairments, and pathological alterations in the hippocampus and prefrontal cortex. Depression is a prevalent and debilitating disorder with a substantial global burden.

***Objective*:** The present study aimed to evaluate the antidepressant potential of the Unani formulation *Majoon Boolis* in Chronic Unpredictable Mild Stress (CUMS)-induced depressive-like behavior in mice.

***Methods*:** Male Swiss albino mice (20–30 g) were randomly divided into six groups (n = 8): vehicle-treated control, vehicle-treated CUMS, WS-treated CUMS, and *Majoon Boolis* (MB)-treated CUMS at low, medium, and high doses. The CUMS paradigm involved daily exposure to a variety of mild stressors, including food deprivation, cage shaking, intermittent cold exposure, hot-air streaming, overnight illumination, wet cage, and tilted cage, for 28 days. One hour after the assigned treatment, behavioral assessment was performed using the glucose preference test to evaluate anhedonia. Following behavioral testing, blood, brain, and adrenal gland tissues were collected for biochemical and molecular analyses.

***Results*:** CUMS exposure produced pronounced behavioral anomalies in mice, characterized by anhedonia, behavioral despair, and anxiety-like behavior. Treatment with *Majoon Boolis* markedly and significantly attenuated CUMS-induced depressive-like symptoms and improved behavioral performance.

***Conclusion*:** The findings demonstrate the beneficial effect of the Unani formulation *Majoon Boolis* in mitigating CUMS-induced depression in mice, plausibly mediated through its antioxidant, anti-inflammatory, neuroprotective, and adaptogenic properties.

Keywords: Majoon Boolis, Unani formulation, Chronic Unpredictable Mild Stress, Depression, Traditional medicine.

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EVALUATION OF ANTIHYPERGLYCEMIC POTENTIAL OF *Trichosanthes bracteata* (LAM.) VOIGT THROUGH PRECLINICAL MODEL.

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ABSTRACT

***Background & Objective*:** Hyperglycemia is a metabolic disorder characterized by elevated blood glucose levels and represents a significant global health concern. Limitations associated with current therapeutic agents have encouraged the investigation of medicinal plants traditionally used for glycemic control. *Trichosanthes bracteata* leaves are traditionally employed to manage elevated blood glucose levels, however, scientific validation of their antihyperglycemic activity remains limited.
This study aimed to evaluate the antihyperglycemic activity of *Trichosanthes bracteata* leaves crude extract in HFD, streptozotocin–nicotinamide-induced hyperglycemic Swiss albino mice.

***Methods*:** A pretreatment design was used to assess the antihyperglycaemic efficacy of the *Trichosanthes bracteata* leaf extract in swiss albino mice (n = 8/group). Animals were assigned to normal control, diabetic control (HFD + streptozotocin 40 mg/kg + nicotinamide), standard (metformin 100 mg/kg), and extract-treated groups (200 mg/kg). Treatments were administered for 64 days. Body weight and fasting blood glucose were monitored periodically, while oral glucose tolerance, lipid profile, liver and kidney function indices, and insulin levels were evaluated at study termination. On Day 64, tissues and plasma were collected for biochemical and histological analyses. Data were analyzed by one-way ANOVA with Tukey's post hoc test ($p < 0.05$).

***Results*:** Pre-treatment with the extract produced significant antihyperglycemic effects, accompanied by improvement in glucose tolerance, body weight, lipid profile, liver parameters and KFT profile.

***Conclusion*:** The findings establish *Trichosanthes bracteata* leaf extract as a promising natural antihyperglycaemic agent with additional metabolic and organ-protective benefits, including improvement of lipid homeostasis, preservation of hepatic and renal function. Collectively, these effects suggest that the extract not only controls hyperglycaemia but also mitigates diabetes-associated metabolic complications, thereby supporting its potential development as a safe and effective phytotherapeutic candidate for long-term management of diabetes and related disorders.

Keywords: *Trichosanthes bracteata*, HFD (High Fat Diet), Hyperglycaemia.

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EXPLORING COUMARIN-TRIOXANE HYBRIDS AS NOVEL ANTI-INFLAMMATORY AGENTS: AN *IN SILICO* APPROACH

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ABSTRACT

***Background*:** Inflammation is an adaptive response that is triggered by harmful stimuli and conditions, including tissue damage and infection. Coumarin is known for its anti-inflammatory activity, as it inhibits the cyclooxygenase-2 enzyme (COX-2) and modulates the Nrf-2 pathway, and trioxane, an artemisinin-based scaffold, modulates both the Nrf-2 and ROS pathways, both of which have potential anti-inflammatory activity. So, by hybridising them, it may have able show effective anti-inflammatory effects.

***Objective*:** To evaluate the anti-inflammatory activity of coumarin-trioxane hybrids by *in silico* studies

***Methods*:** An *in silico* studies are computational data analysis that is done for further evaluation of biological studies and for synthesis. In this study, 158 coumarin-trioxane derivatives were designed using ChemDraw 16.0. Compounds were screened for ADMET properties using SwissADME software and toxicity using ProTox 3.0. Docking simulations were done using PyRx, targeting a cyclooxygenase-2 inhibitor (PDB ID: 3PGH). Best binding affinities were analysed to evaluate anti-malarial potential, and best docking scores were identified.

***Results and Conclusions*:** From *in silico* studies, a total of 4 compounds were selected for further synthesis and further anti-inflammatory evaluation. Docking studies revealed that these 4 compounds having highest binding affinity (1A30: -8.2kcal/mol, 1A31: -8.8kcal/mol, 1H6: -8.9kcal/mol and 1H9: -8.6kcal/mol), taking celecoxib as a standard ligand having binding affinity (-9.1kcal/mol). Key interactions of the COX-2 active site indicate potential inhibition of COX-2-mediated inflammation and disruption of Nrf-2 interaction, enhancing anti-inflammatory activity. Additionally, *in silico* ADMET profiling confirmed favourable drug-likeliness, bioavailability, and safety, reinforcing the coumarin-trioxane hybrid as a viable candidate for anti-inflammatory activity.

Keywords: Inflammation, *in silico* studies, anti-inflammatory activity.

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NEUROPROTECTIVE EFFECT OF MAJOON BOOLIS: PRECLINICAL BEHAVIORAL ACTIVITY

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ABSTRACT

***Background*:** Majoon Boolis, a classical Unani polyherbal preparation, has been traditionally used to boost brain strength, improve memory and combat mental weakness. It is composed of 13 herbs *viz.*, *Cuscuta reflexa*, *Piper nigrum*, *Semecarpus anacardium*, *Cinnamomum zeylanicum*, *Polyporus officinalis*, *Pistachia lentiscus*, *Saussurea lappa*, *Cinnamomum cassia*, *Aloe vera*, *Ruta graveolens*, *Acorus calamus*, *Crocus sativus* and *Aristolochia rotunda* that collectively contribute to its therapeutic potential. Moreover, traditional polyherbal formulations are increasingly explored for their multitarget neuroprotective and cognitive-enhancing potential.

***Objective*:** The present study aimed to evaluate the neuroprotective and behavioral effects of Majoon Boolis in a preclinical Chronic Unpredictable Mild Stress (CUMS) models in rodents.

***Methods*:** Adult male Swiss albino mice (20–30 g) were used in this study and randomly distributed into six groups (n = 8). These included a normal control group, a CUMS-exposed group receiving vehicle, a standard treated CUMS group, and three CUMS groups treated with Majoon Boolis (MB) at graded doses. Chronic Unpredictable Mild Stress protocol was carried out over 28 days and consisted of daily exposure to varied stressors such as food deprivation, cage shaking, cold and heat stress, prolonged illumination, wet bedding, and cage tilting. Behavioral alterations associated with stress were assessed using the Morris Water Maze. Subsequently, biological samples including blood and brain were collected for downstream biochemical and molecular evaluations.

***Results*:** Chronic Unpredictable Mild Stress (CUMS) produced significant cognitive impairments in mice, reflected by deficits in learning, memory retention, and cognitive performance during behavioral assessments. Treatment with Majoon Boolis significantly improved cognitive function, demonstrated by enhanced memory performance, improved learning ability, and restoration of normal exploratory and adaptive behaviors compared to CUMS controls.

***Conclusion*:** The observed cognitive improvement suggests that Majoon Boolis exerts protective effect against stress-induced neuronal and synaptic dysfunction, supporting its potential as a neuroprotective agent for management of cognitive deficits.

Keywords: Majoon Boolis, Chronic Unpredictable Mild Stress (CUMS), cognitive function, neuroprotective

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MOLECULAR DOCKING AND MOLECULAR DYNAMICS SIMULATION STUDIES OF DIHYDROQUINAZOLINONE–PYRIDINE HYBRIDS AS POTENTIAL ANTIMALARIAL AGENTS

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ABSTRACT

***Background*:** Malaria remains a major global health burden, particularly in tropical and subtropical regions, and the rapid emergence of resistance to existing antimalarial drugs necessitates the discovery of new therapeutic scaffolds. Quinazolinone derivatives are known for their diverse biological activities, and the incorporation of pyridine moieties has the potential to enhance drug-likeness and strengthen protein–ligand interactions.

***Objective*:** This study aimed to design and computationally evaluate a series of dihydroquinazolinone–pyridine hybrids as potential inhibitors of wild-type *Plasmodium falciparum* dihydroorotate dehydrogenase (*Pf*DHODH), a key enzyme in the parasite's de novo pyrimidine biosynthesis pathway.

***Methods*:** Molecular docking studies were performed against *Pf*DHODH (PDB ID: 3I65) using the CDOCKER protocol implemented in BIOVIA Discovery Studio to predict binding modes and estimate binding affinities. The most promising docked complexes were further subjected to molecular dynamics simulations using Schrödinger Desmond to assess the stability and dynamic behavior of protein–ligand interactions over time.

***Results*:** Among the evaluated compounds, 2-(4-hydroxy-3-nitrophenyl)-3-(6-methylpyridin-3-yl)-2,3-dihydroquinazolin-4(1H)-one exhibited the strongest binding affinity (–114.352 kcal/mol), significantly outperforming the reference inhibitor DSM1 (–84.4872 kcal/mol). Detailed interaction analysis revealed multiple stabilizing interactions, including attractive charge interactions, π–cation, π–anion, π–sulfur, and C–H bonds. Molecular dynamics simulations confirmed the formation of a stable protein–ligand complex throughout the simulation period, indicating favorable conformational stability.

***Conclusion*:** The results demonstrate that pyridine substitution within the quinazolinone framework markedly enhances binding orientation and interactions with key catalytic residues of *Pf*DHODH. These findings highlight dihydroquinazolinone–pyridine hybrids as promising lead candidates for antimalarial drug development, meriting further experimental validation, toxicity assessment, and optimization of drug-like properties.

Keywords: Molecular Docking, Molecular Dynamics, Malaria, Dihydroquinazolinone.

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IN VITRO EVALUATION OF THE ANTHELMINTIC ACTIVITY OF *Terminalia bellirica* AGAINST *Ascaridia galli*

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ABSTRACT

***Background*:** Helminth infections are among the most neglected tropical diseases, affecting over 1.5 billion people worldwide. Apart from human, it also affects poultry causing significant reduction in productivity, especially in tropical regions where drug resistance against conventional anthelmintics is increasingly reported. *Ascaridia galli* is a major gastrointestinal nematode responsible for weight loss, poor feed conversion and decreased egg production. Plant-based alternatives such as *Terminalia bellirica* are gaining attention due to their ethnomedicinal importance as anthelminth and presence of diverse bioactive constituents.

***Objectives*:** The study assessed the prevalence of gastrointestinal helminth parasites in domestic chickens and evaluated the *in vitro* anthelmintic activity of aqueous and methanolic fruit extracts of *T. bellirica* against adult *A. galli*.

***Methods*:** A total of 450 intestinal samples of local chickens were collected immediately after slaughter from various meat shops of Dibrugarh district, Assam. Worms were identified morphologically and exposed to different concentrations of the extracts (10, 20 and 30 mg/ml). Albendazole (10 mg/ml) and PBS served as positive and negative controls, respectively. Anthelmintic efficacy was determined using motility scoring and Relative Motility (RM) values.

***Results*:** The prevalence observed in the present study was found to be at a moderate level. Both extracts exhibited concentration-dependent increase in activity, with 30 mg/ml producing rapid paralysis and mortality comparable to albendazole. The comparable activity with albendazole indicates the potential of *T. bellirica* as an alternative control strategy.

***Conclusion*:** The study validates the traditional use of *T. bellirica* and supports its potential as a natural anthelmintic for sustainable poultry parasite management. Further *in vivo* studies, toxicity assessment and isolation of active phytocompounds of *T. bellirica* are currently ongoing.

Keywords: Helminthiasis, round worm, ethnomedicine

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FORMULATION AND OPTIMIZATION OF TRANSFEROSOME BASED HYDROGEL FOR LOCALIZED TREATMENT OF BACTERIAL INFECTIONS IN THE VAGINAL REGION

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ABSTRACT

***Background*:** Vaginitis is an inflammation of the vaginal epithelium and represents one of the most common gynecological conditions among women of reproductive age. Among its types, bacterial vaginosis (BV) is the most prevalent, resulting from disruption of normal vaginal microbiota and overgrowth of anaerobic bacteria. According to the World Health Organisation (2023), BV affects approximately 23-29% of women globally, with the highest prevalence reported in South Asia. Conventional therapies using metronidazole and clindamycin, though effective, are associated with limitations such as poor retention, leakage, rapid drug clearance, and lack of sustained release, which may compromise therapeutic outcomes and patient compliance.

***Objective*:** The study aimed to develop and optimize a mucoadhesive transferosome-based hydrogel system for improved localized vaginal delivery of metronidazole and clindamycin.

***Methods*:** Eight transferosomal formulations were prepared by using soy lecithin and tween 80, and evaluated for particle size, zeta potential, polydispersity index, and drug entrapment efficiency. The optimized formulation was incorporated into hydrogel bases containing HPMC and poloxamer 407. Hydrogels were assessed for viscosity, mucoadhesive strength, and in vitro permeation behaviour. All experimental values were expressed as mean (n=3).

Results and Conclusion: The optimized transferosomal formulation exhibited a particle size of 176.2 ± 42.8 nm, zeta potential of 29.21 ± 0.8 mV, entrapment efficiency of 75.6 ± 3.5 %, and acceptable polydispersity index, indicating good stability and uniformity. *In vitro* permeation studies demonstrated sustained drug release with a permeability coefficient of 0.0028, along with superior mucoadhesive properties compared to other formulations and marketed gel. The findings confirm the successful development of a stable, sustained-release transferosomal hydrogel with potential to enhance localized therapeutic efficacy and patient compliance in the management of bacterial vaginosis.

Keywords: Bacterial vaginosis, Transferosomes, Mucoadhesive Hydrogel, Intravaginal Drug Delivery

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NEXT-GENERATION BIO-MONITORING: LEVERAGING MICROBIAL GENETIC CIRCUITS FOR HIGH-RESOLUTION SPATIOTEMPORAL SENSING OF FERMENTATION METABOLITES

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ABSTRACT

***Background*:** Conventional bioprocess monitoring relies on physical probes and offline sampling, which lack the resolution to detect micro-environmental gradients and metabolic heterogeneity within large-scale bioreactors. Objective: This study aims to develop whole-cell biosensors using synthetic genetic circuits to enable real-time, high-resolution spatiotemporal sensing of key fermentation metabolites.

***Methods*:** Using *E. coli* as a chassis, we engineered orthogonal genetic circuits comprising a metabolite-responsive promoter, a signal-processing logic gate, and a super folder Green Fluorescent Protein (sfGFP) reporter. The circuit's sensitivity and dynamic range were optimized through mathematical modelling using the Hill Equation to align with industrial metabolite concentrations.

***Results*:** The engineered biosensors successfully detected glucose and acetate fluctuations with high sensitivity (K≈10mM). In a simulated 10-L stirred-tank reactor, the "living probes" provided a fluorescent map of metabolic "dead zones" that were previously undetectable by standard DO2 probes.

***Conclusion*:** These results demonstrate that microbial genetic circuits can function as robust, low-cost analytical tools for precision bioprocess monitoring, offering a pathway to significantly enhance yield and process stability in industrial biotechnology.

Keywords: Synthetic Biology, Whole-cell Biosensors, Bioprocess Monitoring, Genetic Circuits

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DEVELOPMENT AND CHARACTERISATION OF AMLODIPINE BESYLATE SUSTAINED RELEASE MICROCAPSULES

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ABSTRACT

***Background*:** Amlodipine Besylate, a calcium channel blocker widely prescribed for the management of hypertension and angina pectoris. It acts by blocking L-type calcium channels, thereby inhibiting the influx of calcium-ions into vascular smooth muscle and cardiac muscle, causing peripheral arterial vasodilation and reducing systemic vascular resistance. Although it has a relatively long elimination half-life, development of sustain release formulations may help to maintain steady plasma drug levels and improve therapeutic consistency.

***Objectives*:** To develop and characterize amlodipine besylate sustained release microcapsules using the phase separation (coacervation) technique in order to improve patient compliance and therapeutic outcome.

***Methods*:** The microcapsules were prepared by coacervation phase separation method by using Amlodipine Besylate (API) as the cargo. Ethyl Cellulose polymer was used as an encapsulating material. The coacervates of ethyl cellulose formed and deposits on the cargo in the Cyclohexane solvent owing to temperature dropdown. Characterization was carried out to ascertain certain parameters such as percentage yield, drug loading, entrapment efficiency, Carr's index. FTIR and in vitro drug release studies were carried out. The drug release data's were fitted into various kinetic models to understand the drug release mechanism.

Result and Conclusion: The results demonstrate that the prepared microcapsules displayed satisfactory flow properties, moderate entrapment efficiency and drug loading. The *in vitro* release profile showed control drug release, with an initial burst followed by gradual release then plateauing around 46% by 5 hours, showing polymer-controlled sustained release behavior. Kinetic models indicated that diffusion from the ethyl cellulose matrix is the primary mechanism of drug release. The study demonstrated that ethyl cellulose based microcapsules are capable of releasing the cargo over an extended period of time in a sustained manner.

Keywords: Amlodipine Besylate, calcium channel blocker, hypertension, sustained release.

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FORMULATION AND CHARACTERIZATION OF HERBAL GEL INCORPORATING *Punica granatum* EXTRACT RICH IN BIOACTIVE PHYTOCONSTITUENTS.

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ABSTRACT

***Background*:** Gels are semi-solid preparations that contain small inorganic particles or large organic molecules interpenetrated by a liquid. Herbal gels offer several advantages over other gels. We used *Punica granatum* for herbal gel Preparation. A polyphenol compound, Punicalagin is present in *Punica granatum* which reported to possess antioxidant properties. Also, the fruit has good antimicrobial, antiseptic, and anti-inflammatory activities to keep skin healthy against dryness, roughness, skin redness and acne.

***Objective*:** To formulate an herbal gel incorporating *Punica granatum* fruit extract and evaluate its physicochemical properties.

***Methods*:**

Juice extraction*:* The fruit was washed with distilled water and chopped manually. The juice was manually extracted from the arils.

Peels and seed extraction*:* Peel and seed were extracted separately using the same method & dried in a microwave & then powdered. For ethanolic extraction, 8 g of powder was taken in 64 ml of ethanol and heated for 1 hour using a mechanical stirrer at 30°C & filtered using Whatman filter paper.

Preparation of the gel: 15 ml of pomegranate juice was taken in a beaker and heated at 40°C for some time. 1g of Carbopol 940 was added with continuous stirring. Tocopherol was added by heating on a water bath, then it was mixed properly until a uniform gel was formed.

Result and Conclusion: The formulated gel exhibited satisfactory physicochemical characteristics with acceptable pH and spreadability**.** Pomegranate juice was used in the gel's formulation, and it was tested. Since the gels include antioxidants as well as anti-inflammatory, antiseptic, and antibacterial properties, it can be concluded that they can be employed as multipurpose gels.

Keywords: *Punica granatum*, herbal gel, Punicalagin, antioxidant activity.

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EXPLORING THE THERAPEUTIC POTENTIAL OF *Annona Reticulata* LINN FOR DIABETES TREATMENT: A NETWORK PHARMACOLOGY

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ABSTRACT

Background: *Annona reticulata* Linn is one among all of traditionally important plants used in the treatment of various ailments belonging family of Annonaceae. Diabetes mentioned in ancient scripts is recognized as a serious illness, characterized by elevated blood sugar level accompanied with disturbed metabolism of fats and protein. Network pharmacology has been introduced to study diabetes combined with drugs their target protein and disease and form drug target disease network. Based on the approach of network pharmacology, the works has been successful in predicting active ingredients, their target potential for application of type 2 diabetes and aid to understand mechanism of action. It identifies key genes and pathway associated with the pathogenesis of diabetes from new insights.

***Objectives*:** To conduct a comprehensive *in silico* screening to identify bioactive anti diabetic compounds present in the *Annona reticulata* Linn using Network Pharmacology.

***Methods*:** In this experiment at first the smiles of the active compounds of the given plant, then the pharmacokinetic profiles are obtained, afterwards the biological target are obtained, next the protein protein interaction are done, atlast Hub genes are obtained which modulate diabetic pathway.

***Result and Conclusion*:** The findings from experimental and computational studies support the potential of *Annona reticulata* as a natural antidiabetic agent. The phytoconstituents, favourable pharmacokinetic properties, and ability to act on multiple genes and pathways offer a holistic approach to diabetes management. Continued research, including clinical validation and isolation of its most active constituents, could pave the way for developing new plant based therapies.

Keywords: *Annona reticulata* Linn, Diabetes, Network Pharmacology

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GREEN SYNTHESIS OF COPPER NANOPARTICLES FROM *Cinnamomum tamala* (BUCH.-HAM) T. NEES & C. H. EBERM. THEIR CHARACTERIZATION AND *IN VITRO* EVALUATION OF ANTI-UROLITHIATIC ACTIVITY

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ABSTRACT

***Background*:** The creation of nanoparticles by green synthesis technique is one of the new developments in nanotechnology which has gained considerable attention due to their eco-friendly nature and potential applications in a broad range. During the research process it has been found that metal nanoparticles synthesized from the plant materials have greater applications in the medicinal field.

***Objective*:** To synthesize copper nanoparticles using biological methods from *Cinnamomum tamala* and evaluate its anti-urolithiatic activity.

***Methodology*:** This research is based on the green synthesis of copper nanoparticles by using the leaf extract of *Cinnamomum tamala* and *in vitro* evaluation of its anti-urolithiatic activity. The work was initiated by a deep study of the literature followed by the green synthesis of CuNPs from the plant and their characterization. Then the *in vitro* evaluation of anti-urolithiatic was carried out by nucleation and aggregation assay.

***Results*:** The synthesized CuNPs are confirmed by UV-Visible and FTIR spectrum. Zeta sizer was used for the particle size distribution and found to be 281.5 nm. The IC_{50} value for CuNPs was found to be 744.65 µg/ml for nucleation assay and 874.91 µg/ml for aggregation assay.

***Conclusion*:** The research provides a thorough analysis of the synthesized CuNPs and their potential application in combating urolithiasis. The results found in the study contribute to the understanding that the CuNPs synthesized from *Cinnamomum tamala* has the potential to inhibit the crystal growth by *in vitro* methods.

Keywords: Nanoparticle, Green synthesis, Copper nanoparticle, Urolithiasis

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PHARMACOGNOSTIC PROFILING AND PHYTOCHEMICAL SCREENING OF ETHNOMEDICINAL PLANTS FROM MIZORAM

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ABSTRACT

***Background*:** Medicinal plants used in traditional healthcare systems require scientific authentication and standardization to ensure their quality, purity, and therapeutic reliability. Pharmacognostical evaluation provides essential diagnostic parameters for identification and quality control of crude drugs.

***Objective*:** The present study aimed to establish Pharmacognostical standards and perform preliminary phytochemical screening of a traditionally used ethnomedicinal plant employed by the Mizo tribe.

***Methods*:** Detailed macroscopic and microscopic examinations were conducted to determine diagnostic morphological and anatomical characteristics. Quantitative microscopy was performed to evaluate leaf constants such as stomatal index, vein-islet number, and vein-termination number. Powder microscopy was carried out to identify characteristic tissue fragments useful for drug authentication. Physicochemical parameters including ash values, extractive values, and moisture content were determined using standard pharmacopoeial methods. Preliminary phytochemical screening was performed using successive solvent extracts to detect major classes of phytoconstituents.

***Results and Conclusion*:** The plant exhibited distinctive macro-microscopic features and diagnostic powder characteristics that can serve as reliable markers for identification. Quantitative leaf constants provided taxonomically significant values, while physicochemical parameters established purity standards for the crude drug. Phytochemical screening revealed the presence of important bioactive constituents such as alkaloids, flavonoids, tannins, glycosides, and phenolic compounds. These findings provide baseline pharmacognostical standards for authentication and quality control of this ethnomedicinal plant and scientifically support its traditional use. The experimental data may facilitate future pharmacological studies and development of standardized herbal formulations.

Keywords: Pharmacognosy, Ethnomedicinal plant, Microscopy, Phytochemical screening

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PHYTOCHEMICAL ANALYSIS AND HOLISTIC THERAPEUTIC INTERVENTION OF PATOLA (*Trichosanthes dioica*): A TRANSLATIONAL RESEARCH PERSPECTIVE

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ABSTRACT

***Background*:** Patola (*Trichosanthes dioica*), a widely used medicinal plant in traditional Ayurvedic and folkloric systems of medicine across South and Southeast Asia, has been historically recognized for its therapeutic properties including anti-diabetic, anti-inflammatory, antipyretic, hepatoprotective, and antioxidant activities. Despite its extensive ethnopharmacological use, a comprehensive phytochemical characterization linking its bioactive constituents to evidence-based pharmacological outcomes remains insufficiently explored, creating a significant gap between traditional knowledge and modern translational research.

***Objective*:** This study aims to conduct systematic qualitative and quantitative phytochemical analysis of *Trichosanthes dioica* to identify and quantify its key bioactive compounds and correlate these findings with its documented therapeutic activities, supporting a holistic and translational research framework.

***Methods*:** Successive solvent extractions of *Trichosanthes dioica* plant parts — including fruit, leaves, and seeds — were performed using solvents of increasing polarity. Qualitative phytochemical screening was conducted to detect the presence of alkaloids, flavonoids, saponins, tannins, terpenoids, glycosides, and phenolic compounds following standard protocols. Quantitative estimation of total phenolic content (TPC), total flavonoid content (TFC), and total alkaloid content was carried out using established spectrophotometric methods. Bioactive compound profiling was further supported by HPTLC and GC-MS analysis.

***Results and Conclusion*:** Qualitative screening confirmed the presence of flavonoids, alkaloids, saponins, and phenolics, with quantitative analysis revealing significantly high total phenolic and flavonoid content, supporting the plant's antioxidant and anti-inflammatory potential. Key bioactive constituents — including cucurbitacins, flavone glycosides, and triterpenoids — mechanistically validate its traditional use in diabetes, liver disorders, and inflammatory conditions. These findings advocate for the translational development of *Trichosanthes dioica* into standardized phytopharmaceutical formulations, reinforcing the value of integrating ethnopharmacological knowledge with modern analytical tools for contemporary therapeutic applications.

Keywords: *Trichosanthes dioica*, Phytochemical Analysis, Bioactive Compounds, Translational Research

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DESIGN, *IN SILICO* STUDIES AND SYNTHESIS OF NOVEL AMINE SUBSTITUTED INDOLE DERIVATIVES CONTAINING 1,2,4-TRIAZOLE AS POTENTIAL WOUND HEALING AGENT

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ABSTRACT

***Background*:** Wound healing is one of the most complex biological process in human body, achieved through four precise and highly programmed phases: hemostasis, inflammation, proliferation and remodeling, in which vascular endothelial growth factor receptor-2 (VEGFR2) plays a crucial role.

***Objective*:** In the present study, a series of novel amine-substituted Indole derivatives containing a 1,2,4-triazole moiety was designed, synthesized and characterized.

***Method*:** A multistep synthetic scheme was formulated starting from indole-3-acetic acid, followed by alkylation, triazole substitution, acyl chloride formation, and subsequent reactions with selected amines to yield final derivatives. *In silico* molecular docking studies were performed against the human VEGFR2 kinase using Schrodinger Maestro to predict binding affinity and interaction profiles.

***Results and Conclusion*:** The docking results demonstrated favorable binding energies, i.e. -8.5 kcal/mol and -8.3 kcal/mol respectively and shows significant interactions within the active site of VEGFR2. ADME predictions indicated good gastrointestinal absorption, acceptable bioavailability scores (0.55), compliance with Lipinski's rule of five, and moderate solubility profiles suggesting favorable drug-likeness properties. The synthesized compounds were characterized by TLC, FT-IR, ^{1}H NMR, ^{13}C NMR and mass spectroscopy, confirming their structural integrity and purity. Physicochemical evaluation revealed satisfactory yields (50-80%) and defined melting points. pOverall, the combined synthetic, spectroscopic and computational findings suggest that the designed indole-triazole derivatives, particularly the compounds under investigation may serve as promising lead molecules for further development as potential wound healing agents targeting VEGFR2.

Keywords: Indole, Triazole, Docking, Synthesis

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DESIGN, SYNTHESIS, CHARACTERIZATION AND ANTIPROLIFERATIVE EVALUATION OF INDOLE-PYRIMIDINE DERIVATIVES

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ABSTRACT

***Background*:** The Epidermal Growth Factor Receptor (EGFR) is a fundamental transmembrane protein that regulates critical intracellular signaling cascades, including the PI3K/Akt and MAPK pathways. In several malignancies, overexpression of EGFR drives aberrant cellular proliferation and survival, establishing it as a high-priority target for targeted cancer therapy. This research focuses on the privileged scaffold approach, integrating the indole nucleus with a pyrimidine core to develop novel hybrid molecules capable of inhibiting EGFR tyrosine kinase activity.

***Objective*:** The study aimed to design and synthesize a novel series of indolyl-pyrimidine derivatives utilizing acetophenones as precursor. The primary objectives were to establish a robust synthetic methodology and to evaluate the antiproliferative potential of these hybrid scaffolds against cancer cell growth.

***Methods*:** The target compounds were prepared via two-step synthetic protocol. The initial phase involved a Claisen-Schmidt condensation between indole-3-carbaldehyde and substituted acetophenones. In the subsequent phase, the intermediate was cyclized with guanidine hydrochloride. This cyclocondensation resulted in the formation of the targeted derivatives. The targeted molecule was assessed using MTT assay against HeLa cells. *In silico* molecular docking studies was performed against EGFR (PDB: 3W32) to evaluate the binding scores of the designed derivatives.

***Results and Conclusion*:** The synthetic route successfully produced the desired indolyl-pyrimidine derivative with high purity. Biological screening through the MTT assay demonstrated that the p-methyl derivative possesses significant antiproliferative activity, effectively suppressing the viability of the tested cell lines (IC_{50}=34 µg/mL). Also, *in silico* studies demonstrated the efficacy of this compound exhibiting binding affinity of -7.875 Kcal/mol against 3W32, better than the standard, Osimertinib (-7.47 Kcal/mol). In conclusion, this study validated the indolyl-pyrimidine hybrid as a promising pharmacophore for oncology research. These findings provide a compelling template for the further development of highly selective EGFR inhibitors and contribute to the advancement of translational research in holistic therapeutic interventions.

Keywords: EGFR, Indole, Pyrimidine, Antiproliferative.

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DEVELOPMENT OF POLYHERBAL CHEWING GUM: AN ALTERNATIVE FOR NICOTINE CHEWING GUM FOR CESSATION OF CIGARETTES

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ABSTRACT

***Background*:** Cigarette smoking continues to pose serious health risks globally, prompting the need for accessible and safer alternatives to nicotine-based cessation aids. Herbal chewing gum can be designed as safer and non-habitual chewing gum to overcome the limitations.

***Objectives*:** Present work explores the preliminary development of a Polyherbal Chewing gum as a potential alternative to Nicotine Chewing Gum for cigarette cessation, using *Piper nigrum* (Black pepper), *Syzygium aromaticum* (Clove) and *Camellia sinensis* (Tea leaves). These herbs were selected based on their traditional use and properties being reported. Clove is used for its soothing effects on the oral cavity, black pepper is used for its potential to reduce nicotine cravings, and tea leaves for their antioxidant and mild stimulant effects.

***Methods*:** The formulation involves basic extraction techniques, gum base preparation and incorporation of sweetening and softening agents. Phytochemical screening of the extracts was performed using ethanolic extracts of Black pepper, Clove, and Tea leaves. The chewing gum was subjected to preliminary evaluation for physical characteristics such as texture, taste, weight variation, pH determination, uniformity of mass and friability testing.

Results and Conclusion: While the initial findings are promising in terms of formulations feasibility and user acceptability, the product remains in the conceptual stage. No *in vivo* or clinical studies were conducted. Further research standardization and comprehensive testing are essential to validate its effectiveness and safety as a non-nicotine herbal aid for smoking cessation. This work serves as a foundational step towards exploring herbal-based alternatives tobacco harm reduction strategies.

Keywords: Chewing gum, clove, black pepper, tea leaves.

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FORMULATION AND EVALUATION OF GREEN SYNTHESIZED MEDIATED CARBON QUANTUM DOTS-ASTAXANTHIN CO-LOADED LIPOSOMES DERIVED FROM *Emblica Officinalis* FOR ALZHEIMER'S DISEASE

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ABSTRACT

***Background*:** Conventional drugs and nanoparticles show limited blood–brain barrier penetration, restricting effective treatment of neurodegenerative diseases. Carbon quantum dots (CQDs), owing to their small size and intrinsic fluorescence, offer improved potential for brain-targeted delivery but remain underexplored, especially from eco-friendly sources.

***Objective*:** The objective of this study is therefore to evaluate the neuroprotective potential of carbon quantum dots derived from *Emblica officinalis* in the prevention of Alzheimer's disease, and to develop a liposomal formulation co-loaded with these CQDs and astaxanthin to investigate their potential synergistic effects in an Alzheimer's rat model.

***Methods*:** The CQDs were prepared using hydrothermal method, optimized based on temperature and time and evaluated in terms of size, PDI, fluorescence intensity, XRD, XPS and TEM. CQD loaded Liposomes were then formulated using the thin film hydration method and characterised for Size, PDI, zeta potential, fluorescence intensity and TEM.

***Results and Conclusion*:** The optimized CQDs exhibited particle sizes in the range of 8.389 nm to 1.5 nm, and fluorescence intensity of 43000 at an excitation wavelength of 610 nm, with XRD confirming their amorphous nature and XPS indicating surface composition primarily of carbon and oxygen. The quantum yield was 2.63%, and annealing for 24 hours further improved particle size. CQD and Astaxanthin co-loaded liposomes demonstrated a size of 183.4 nm, PDI of 0.201, and zeta potential of −49.4 mV. The formulation achieved an entrapment efficiency of 81.75%, drug loading of 24.58%, and drug content of 18.1%. In-vitro release studies indicated a biphasic pattern consistent with diffusion-controlled sustained release typical of liposomal systems. Green-synthesized CQDs were successfully optimized, exhibiting defined surface composition, measurable quantum yield, and improved characteristics following annealing, and were effectively incorporated into astaxanthin co-loaded liposomes with appropriate size, stability, high entrapment efficiency, and sustained biphasic release. These results highlight their promise for Alzheimer's therapy, with ongoing stability and *in vivo* studies expected to further establish their therapeutic potential.

Keywords: Carbon quantum dots, Astaxanthin, Liposomal formulation, Alzheimer's disorder.

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MOLECULAR INSIGHTS INTO THE ANTI-UROLITHIATIC PROPERTIES OF POLYPHENOL RICH EXTRACTS FROM WILD *Musa* SPP.: INHIBITION OF NUCLEATION AND AGGREGATION IN CALCIUM OXALATE CRYSTALS

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ABSTRACT

***Background*:** Kidney stones affect 10–15% of people worldwide, with men (67%) most affected, especially between 20–40 years. Urolithiasis refers to stone formation in the gallbladder or urinary tract. Litholysis, the dissolution of kidney stones, can be achieved through herbal remedies, as plant compounds interact with stone formation, helping to inhibit growth and potentially dissolve stones.

***Objective*:** This study aimed to address the anti-urolithiatic activity of non-polar, semi-polar and polar extract of *Musa flaviflora* through nucleation assay, aggregation assay, and calculi dissolution of kidney stones.

***Methods*:** Collection of the banana sample i.e. *Musa flaviflora* was done and authenticated, for this study. The seeds were separated from the pulp and dried, following size reduction and extraction using three different solvents namely n-hexane, chloroform and hydro-alcohol. Anti-Urolithiatic activity was evaluated by performing nucleation assay, aggregation assay, and calculi dissolution of kidney stones.

***Results and Conclusion*:** The findings revealed that hydroalcoholic extract of *Musa flaviflora* significantly inhibited the rate of nucleation in lab grown crystals (Calcium oxalate monohydrate) assessed by FTIR analysis. For the *in vivo* inhibitory effect of the extract of *M. flaviflora* on the rate of aggregation was assessed by taking prepared artificial crystals (Calcium oxalate monohydrate) with the standard taken as Cystone tablet and the hydroalcoholic extract of *M. flaviflora* showed good inhibitory activity of aggregate formation. The *in vivo* calculi dissolution of kidney stones was done on real kidney stones and results showed that the hydroalcoholic and chloroform extract has significant activity for stone dissolution with the increase in the time elapse. The study concludes that the seeds of *Musa flaviflora* exhibits promising Anti-urolithiatic property, potential role of semipolar and polar constituents in the activity of the plant extracts and warrants further phytochemical and mechanistic studies to isolate and characterize the active compounds responsible for this effect.

Keywords: Anti-urolithiatic activity, phytoconstituents, Cystone tablet

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DISCOVERY OF NOVEL 1,3,5-TRIAZINE DERIVATIVES AS POTENT ANTIMALARIALS: AN IN-SILICO HIERARCHICAL SCREENING AND MOLECULAR DOCKING APPROACH

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ABSTRACT

***Background*:** Malaria remains a devastating global health challenge, with 282 million cases reported in 2024. The rapid emergence of resistance to traditional drugs like Pyrimethamine and quinine necessitates the urgent discovery of novel chemotherapeutic agents with unique mechanism of action. 1,3,5-triazine derivatives have emerged as a promising scaffold due to their significant biological activities and symmetric structural versatility.

***Objective*:** The primary goal of this study was to design a virtual library of 100 novel 1,3,5- triazine derivatives and evaluate their potential as antimalarial agents by targeting *Plasmodium falciparum* lactate dehydrogenase (1J3K).

***Methods*:**

Library Design: A library of 100 derivatives was generated via site-specific substitutions on the 1,3,5-triazine scaffold.

Virtual Screening: Compounds were initially screened for drug-likeliness using Lipinski ‘s Rule of Five via Molinspiration.

ADMET Analysis: Toxicity (mutagenicity, carcinogenicity) and Pharmacokinetics (ADME)were predicted using the CHARMm-based CDOCKER algorithm.

Validation: The docking protocol was validated through Root Mean Square Deviation (RMSD)calculations to ensure structural accuracy (target&lt,2.0).

***Results and Conclusion*:** Out of 100 compounds, 50 strictly adhered to Lipinski ‘s Rule of five (miLogP: 2.04 to 4.95). Rigorous toxicity screening narrowed the pool to 36 candidates for docking. The study successfully identified five lead compounds (A14, A68, A72, and A84) that exhibited superior negative binding energies and optimal interaction profiles within the 1J3K receptor pocket. This *in silico* investigation identifies novel 1,3,5 triazine derivatives with high bonding affinity and favorable safety profiles. These compounds represent significant “hits” that can accelerate the drug discovery process offering a cost effective and efficient pathway towards synthesizing next generation antimalarials to overcome parasitic resistance.

Keywords:1,3,5-triazine, Antimalarial, Molecular Docking

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CARDIOMETABOLIC AND MOLECULAR MECHANISMS OF DIABETES ASSOCIATED CARDIOVASCULAR COMPLICATIONS

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ABSTRACT

***Background*:** Diabetes mellitus is a chronic metabolic condition that is closely linked to atherosclerosis, chronic inflammation, and cardiovascular disease. Chronic hyperglycaemia damages the heart and raises morbidity and mortality through immunological dysregulation, metabolic reprogramming, and oxidative stress. The necessity of integrated therapeutic approaches that target cardiometabolic pathways is highlighted by recent clinical and molecular results.

***Objective*:** The intention of this study is to offer an overview of recent clinical and experimental studies on the myocardial and metabolic pathways producing cardiovascular disorders associated with diabetes, as well as investigate potentially novel therapy targets.

***Methods*:** Results from recent experimental and clinical trials on glucagon-like peptide-1 receptor agonists (GLP-1RAs), microRNA-mediated control, and inflammatory signalling pathways associated with diabetes-induced cardiovascular disease were compiled using a narrative review methodology.

***Results and Conclusion*:** The cardioprotective benefit of oral semaglutide in individuals with type 2 diabetes and existing cardiovascular disease is demonstrated by clinical trial data, which support the use of GLP-1 receptor agonists in reducing cardiovascular risk. Experimental studies have shown that decreased expression of miR-369-3p, via the succinate-GPR91 signalling pathway, promotes macrophage inflammation, increasing oxidative stress and hastening the formation of atherosclerotic plaque. Additionally, diabetes emphasizes the rapid onset of cardiovascular damage during the development of diabetes by causing early molecular and morphological changes in cardiovascular tissues, including osteogenic differentiation in aortic valves, endothelial activation, and extracellular matrix remodelling. A combination of clinical and molecular evidence suggests that reducing diabetes associated cardiovascular issues may be achieved by targeting cardiometabolic inflammation, oxidative stress, and immunometabolic signalling pathways. If future research concentrates on precision medicine approaches, patients with diabetes may benefit from improved prevention and treatment outcomes.

Keywords: Diabetes mellitus, Cardiovascular disease, Inflammation, GLP-1 receptor agonists

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FORMULATION AND EVALUATION OF METFORMIN LOADED MICROPARTICLE BEADS USING IONOTROPIC GELATION METHOD

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ABSTRACT

***Background*:** Metformin is a first-line therapy for type 2 diabetes, but its conventional dosage forms often lead to frequent dosing, poor patient compliance, and gastrointestinal side effects. Microbead- based controlled release systems using natural polymers like sodium alginate and chitosan offer a promising approach for sustained delivery.

***Objective*:** The objective of the study was to formulate and evaluate metformin-loaded microparticle beads via ionotropic gelation for enhanced entrapment efficiency, controlled release, and potential in diabetes management.

***Methods*:** Beads were prepared using sodium alginate, chitosan, bovine serum albumin (BSA), and calcium chloride with a peristaltic pump. Preformulation studies like physical properties, solubility, and melting point were evaluated. Formulations were evaluated for percentage yield, drug entrapment efficiency, swelling index, *in vivo* drug release (analyzed via zero-order, first-order, Higuchi, and Korsmeyer-Peppas models), particle size (microscopy), and surface morphology (SEM).

***Results and Conclusion*:** Entrapment efficiency ranged from 75.02% to 84.03%, with percentage yield at 44.02%- 63.03%. Formulation F3 exhibited the highest drug release (79.82%), optimal swelling, and uniform particle size (~200 µm). All formulations followed zero-order kinetics and Fickian diffusion (Korsmeyer-Peppas n &lt, 0.5). Ionotropic gelation successfully produced metformin-loaded microbeads with high encapsulation and controlled release. F3 was the most effective, highlighting its potential for sustained delivery to improve patient compliance and minimize side effects in diabetes therapy.

Keywords: Metformin, Ionotropic Gelation, Microbeads, Drug Release Kinetics, Controlled Release Diabetes

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ARTIFICIAL INTELLIGENCE FOR PERSONALIZED ANTIDIABETIC THERAPY SELECTION: A LITERATURE REVIEW

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ABSTRACT

***Background*:** Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by heterogeneous patient responses to antidiabetic therapy. Conventional treatment follows standardized guidelines, often resulting in trial-and-error prescribing and delayed glycemic control. Artificial Intelligence (AI) has emerged as a promising tool to support personalized pharmacotherapy.

***Objective*:** To review recent literature (2022–2025) on the application of AI in personalized antidiabetic therapy selection and evaluate its potential role in clinical pharmacy practice.

***Methods*:** A literature review was conducted using recent peer-reviewed studies published between 2022 and 2025 focusing on machine learning applications in diabetes management. Studies evaluating predictive models for drug response, therapy optimization, and risk stratification were analyzed. Commonly reported algorithms included random forest, support vector machines, gradient boosting, and deep neural networks utilizing clinical and biochemical parameters such as HbA1c, body mass index, renal function, lipid profile, age, and prior medication history.

Results and Conclusion: Recent studies demonstrate that AI-based predictive models can stratify patients according to likely response to metformin, SGLT2 inhibitors, GLP-1 receptor agonists, and other antidiabetic agents. Implementation of AI-driven clinical decision support systems has shown improved glycemic outcomes, reduced adverse drug reactions, and enhanced precision in therapy selection. Integration of pharmacogenomic and real-world data further improves predictive accuracy. AI-supported personalized antidiabetic therapy selection represents a significant advancement in precision medicine and clinical pharmacy. Although challenges remain regarding data quality, model interpretability, and regulatory validation, AI has strong potential to reduce empirical prescribing and optimize diabetes management outcomes.

Keywords: Artificial Intelligence, Type 2 Diabetes Mellitus, Personalized Therapy, Machine Learning

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DEVELOPMENT OF *Oroxylum indicum* (L.) LEAF EXTRACT BASED PHYTOSOME GEL: PHYTOCHEMICAL SCREENING, FORMULATION, OPTIMIZATION, AND INVITRO STUDIES

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ABSTRACT

***Background*:** *Oroxylum indicum* is a well-known medicinal plant traditionally used for wound healing and anti-inflammatory purposes. However, poor solubility and limited skin permeability of its bioactive constituents may reduce therapeutic effectiveness.

***Objective*:** The present study aimed to develop and optimize a phytosome-based topical gel of *Oroxylum indicum* leaf extract to improve its skin permeation and therapeutic effectiveness.

***Methods*:** The leaf extract was prepared by maceration method and subjected to preliminary phytochemical screening. Total phenolic content (TPC) and total flavonoid content (TFC) were determined using spectrophotometric methods. TLC and HPTLC analyses were carried out for phytochemical profiling and standardization using Chrysin as a reference marker compound. Phytosome formulation was optimized using Design-Expert software following a Box–Behnken design. Particle size and polydispersity index (PDI) were evaluated. The optimized phytosome was incorporated into a gel base, and blank gel optimization was performed. The final formulation was subjected to *in vivo* evaluation.

***Results and Conclusion*:** The extraction yield was found to be 19.744% w/w. The TPC and TFC were 52.903 mg GAE/g and 89.033 mg QE/g, respectively. TLC and HPTLC confirmed the presence of Chrysin in the extract, ensuring proper standardization. The optimized phytosome formulation showed a particle size of 195.544 d.nm and a PDI of 0.463. Blank gel optimization was achieved at 0.4% polymer concentration. The developed phytosome gel demonstrated satisfactory *in vivo* performance. The study successfully developed and optimized an *Oroxylum indicum* leaf extract-based phytosome gel with suitable physicochemical properties. The formulation may enhance skin permeation and shows potential for wound healing applications.

Keywords: *Oroxylum indicum*, Phytosomal gel, Diabetic wound, Wound healing, Herbal formulation

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PHYTOCHEMICAL PROFILING AND COMPARATIVE EVALUATION OF SECONDARY METABOLITES OBTAINED FROM *Diplazium esculentum* AND THEIR PROSPECTIVE BIOLOGICAL FUNCTIONALITIES

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ABSTRACT

***Background*:** *Diplazium esculentum*, commonly known as & quot, Tukmaria & quot, in India, is a tropical herb that is widely used in traditional medicine due to its anti-inflammatory, anti-microbial, and anti-bacterial properties. Research has shown that the secondary metabolites of *Diplazium esculentum*, such as flavonoids, terpenoids, alkaloids, and triterpenes, are responsible for its medicinal properties. The in-vitro studies revealed that the *Diplazium esculentum* nanoparticles had potent anti-inflammatory and antioxidant activities. The *in vivo* studies showed that DP-NP had improved the liver and kidney functions in mice treated with paracetamol. This study shows the potential of *Diplazium esculentum* nanoparticles as a natural source of nanoparticles with significant biological activities. Nanoparticles made from natural materials such as plants have gained significant attention as they offer many benefits such as being cost-effective and environmentally friendly. One such plant is *Diplazium esculentum*, commonly known as galangal, which has been used as a tonic for various medicinal purposes.

***Objectives*:** To investigate the phytochemical profile and comparative analysis of secondary metabolites present in *Diplazium esculentum* and evaluate their potential biological activities.

***Methods*:** In this study, we characterized nanoparticles (DP-NP) extracted from *D. esculentum* and compared them with other nanoparticles extracted from same plant sources. The potential biological activity of *D. esculentum* nanoparticles (DP-NP) was also examined in *in vivo* and *in vivo* experiments.

Result and Conclusion: A detailed analysis of the size, shape, and surface charges of the nanoparticles was performed, and the results showed that the size of the nanoparticles ranged from 50 to 200 nm, and their shape was spherical. The surface charges of the nanoparticles were negative, which might be due to the presence of polyphenols and other organic compounds in the nanoparticles.

Keywords: *Diplazium esculentum*, Secondary metabolites, Nanoparticles

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LIPID NANOPARTICLES FOR TRANSDERMAL DELIVERY OF BIOACTIVES: A COMPREHENSIVE REVIEW

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ABSTRACT

***Background*:** Transdermal drug delivery has gained increasing attention as an alternative route for administering therapeutic agents because it bypasses first-pass metabolism, improves patient compliance, and allows controlled drug release. However, the outermost layer of the skin, the stratum corneum, acts as a major barrier that limits the penetration of many bioactive compounds, particularly those derived from natural sources with poor solubility and stability. Recent developments in nanotechnology have introduced lipid-based nanocarriers, including solid lipid nanoparticles and nanostructured lipid carriers, as promising systems to enhance dermal and transdermal drug delivery.

***Objectives*:** The objective of this review is to evaluate the potential of lipid nanoparticles as carriers for the transdermal delivery of bioactive molecules and to highlight their advantages, formulation strategies, and therapeutic relevance in topical drug delivery systems.

***Methods*:** A comprehensive literature review was conducted focusing on studies related to lipid nanoparticle-based transdermal delivery systems. Various preparation techniques were analysed, including high-pressure homogenization, emulsification–solvent evaporation, microemulsion, solvent injection, and high-shear homogenization with sonication. In addition, several bioactive compounds encapsulated within lipid nanocarriers and their performance in improving skin permeation and drug stability were examined.

***Result and Conclusion*:** The reviewed studies demonstrate that lipid nanoparticles significantly enhance the solubility, stability, and permeability of bioactive compounds such as quercetin, lycopene, luteolin, resveratrol, and kaempferol. These systems exhibit high encapsulation efficiency, sustained drug release, and improved biological activities including antioxidant, anti-inflammatory, photoprotective, and anticancer effects. Therefore, lipid-based nanocarriers represent a promising and effective platform for transdermal delivery of bioactive and have strong potential for future pharmaceutical and cosmeceutical applications.

Keywords: Transdermal drug delivery, Lipid nanoparticles, Bioactive compounds, Nanotechnology

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DESIGN, SYNTHESIS, AND BIOLOGICAL EVALUATION OF NOVEL 1,2,4,5-TETRAPHENYL IMIDAZOLE DERIVATIVES

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ABSTRACT

***Background*:** Imidazole is a biologically active heterocyclic scaffold present in various biomolecules and new therapeutic agents. Its derivatives, 1,2,4,5-tetraphenyl imidazoles, have a broad spectrum of pharmacological activities, including antimicrobial, antifungal, anticancer, and anti-inflammatory effects.

***Objective*:** To design, synthesize, and study the biological activity of 1,2,4,5-tetraphenyl imidazole derivatives for potential therapeutic applications, with improving pharmacological efficacy and safety profiles.

***Methods*:** New 1,2,4,5-tetraphenyl imidazole derivatives were synthesized by using Debus-Radziszewski imidazole synthesis, a one-pot multi-component reaction approach, and purified by recrystallization. Structural characterization was performed using melting point determination, UV–Visible spectroscopy, FT-IR, ^{1}H NMR, ^{13}C NMR, and mass spectrometry. The synthesized compounds were subjected to preliminary biological evaluation, including antimicrobial activity. Molecular docking studies were conducted to investigate binding interactions with selected biological targets and to predict structure–activity relationships.

***Results and Conclusion*:** The synthesized 1,2,4,5-tetraphenyl imidazole derivatives were successfully obtained with satisfactory yields and confirmed structures. Preliminary biological studies indicated promising antimicrobial potential for selected compounds. Molecular docking analysis revealed favorable binding interactions with the target proteins, suggesting potential mechanisms of action. Overall, the findings highlight the potential of novel tetraphenyl imidazole derivatives as promising lead molecules for further optimization and development of safer and more effective therapeutic agents.

Keywords: 1,2,4,5-tetraphenyl imidazole derivatives, Debus-Radziszewski imidazole synthesis, antimicrobial activity, Structure–activity relationship

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COMPUTATIONAL IDENTIFICATION OF LESS-EXPLORED PLANT-DERIVED MULTI-TARGET INHIBITORS FOR HEPATOCELLULAR CARCINOMA

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ABSTRACT

***Background*:** Hepatocellular carcinoma (HCC) is the leading form of primary liver cancer worldwide. Current targeted therapies are limited by resistance, toxicity, and low survival rate. Plant-derived bioactive compounds offer promising multitarget therapeutic potential with improved safety profiles.

***Objective*:** To identify less-explored plant-derived compounds with strong multi-kinase inhibitory potential against HCC using molecular docking, molecular dynamics simulation, and ADMET prediction.

***Methods*:** Three hundred phytochemicals from the IMPPAT database were selected based on Lipinski's rule of five and structural diversity to prioritise less-explored drug-like compounds. These compounds were then screened against major oncogenic kinases, including EGFR, VEGFR1-2, FGFR1-4, PDGFR-α, C-KIT, RET, C-MET, TIE-2 and FLT3 using molecular docking. Top-ranked ligands were analysed through molecular dynamics simulations to evaluate complex stability. Drug-likeness and pharmacokinetic properties were evaluated using in-silico ADMET tools.

***Results*:** Cornoside and oleuropeic acid showed strong multi-target binding affinity with docking scores ranging from −7.2 to −8.9 kcal/mol. Cornoside showed affinity for VEGFR1, FGFR3 and RET kinase targets, while oleuropeic acid showed affinity for VEGFR1, RET and FLT3 in molecular docking analysis. ADMET analysis indicated that both compounds satisfied Lipinski's rule of five. Cornoside demonstrated moderate toxicity ($LD_{50} \approx 600$ mg/kg) and low GI absorption, whereas oleuropeic acid showed high GI absorption, low toxicity ($LD_{50} \approx 2900$ mg/kg). Molecular dynamics simulations confirmed stable ligand–protein complexes with low RMSD fluctuation and sustained hydrogen bonding.

***Conclusion*:** Cornoside and oleuropeic acid were identified as promising multi-target natural inhibitors against HCC. Further experimental validation is required to confirm their therapeutic potential.

Keywords: hepatocellular carcinoma, molecular docking, molecular dynamics, plant-derived inhibitors.

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DEVELOPMENT AND CHARACTERIZATION OF POLYPHENOL-LOADED MICROPARTICLES USING CARBOXYMETHYL CELLULOSE DERIVED FROM WATER LILY

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ABSTRACT

Background: Polyphenols are effective bioactive compounds for their antioxidant and therapeutic properties. However, the applications of polyphenols are limited as the majority of dietary polyphenols have limited bioavailability and are sensitive to heat, light, and oxygen. Microencapsulation has been considered as an amazing method for improving delivery systems, providing increasing bioavailability, stability, and targeting of bioactive compounds. Polymers derived from renewable biomass have gained increasing attention as sustainable encapsulating materials.

Objective: The present study designed to develop and characterise microparticles loaded with polyphenols using carboxymethyl cellulose (CMC) derived from water lily biomass, with the objective of improving encapsulation efficiency, stability and controlled release behaviour.

Methods: The α-cellulose was isolated from the stem of the water lily, and it was chemically modified to CMC through carboxymethylation. The characterisation of CMC was performed with Fourier Transform Infrared Spectroscopy (FTIR), X-ray diffraction (XRD), and thermal analysis to confirm structural modification and physicochemical properties. Microencapsulation of polyphenol was prepared by the ionic gelation method using the synthesised CMC and sodium alginate. The prepared microparticles were evaluated for particle size, encapsulation efficiency, morphology, surface characteristics, and *in vitro* release profile.

Results and Conclusion: The CMC was successfully synthesised with 80% yield from water lily stem and characterised. Polyphenol-loaded CMC–sodium alginate microparticles were successfully formulated and optimised by the Box–Behnken design. The size of the microparticles was around 90 µm, and the encapsulation efficiency was found to be approximately 87%. The *in vitro* release study provided resistance to acidic conditions and allowed controlled drug release of polyphenols at an alkaline pH. The present study highlights the possible valorisation of aquatic biomass for developing effective excipients in drug delivery systems.

Keywords: Carboxymethyl cellulose, Polyphenols, Microencapsulation, Biomass valorisation

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COMPUTER-AIDED DESIGN AND EVALUATION OF 2,3-DIHYDROQUINAZOLIN-4(1H)-ONE DERIVATIVES AS POTENTIAL ANTIMALARIAL COMPOUNDS

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ABSTRACT

Background: Malaria remains a major global health challenge, particularly in tropical and subtropical regions, due to increasing resistance of Plasmodium species to existing antimalarial drugs. The continuous emergence of drug-resistant strains necessitates the discovery of novel therapeutic agents with improved efficacy and safety profiles. 2,3-Dihydroquinazolin-4(1H)-one (DHQ) is a nitrogen-containing heterocyclic scaffold known for diverse biological activities, including antimicrobial and antiparasitic properties, making it a promising candidate for antimalarial drug development.

Objective: To design and evaluate novel 2,3-dihydroquinazolin-4(1H)-one derivatives as potential antimalarial compounds using computer-aided drug design approaches.

Methods: A library of DHQ derivatives were designed and optimized using ChemDraw Ultra 12.0.2. Pharmacokinetic properties were evaluated using ADMET prediction tool such as SwissADME and toxicity using TOPKAT of Accelrys' Discovery Studio 3.0. Molecular docking studies were performed by using CDOCKER of Discovery Studio 3.0. The ligands were docked against Plasmodium falciparum dihydroorotate dehydrogenase (PfDHODH) with PDB ID: 3i65, 6e0b to assess binding affinity and interaction patterns. The best binding affinity compounds were further analyzed for anti-malarial potential.

Results: From in-silico studies, a total of 10 designed DHQ derivatives exhibited strong binding affinities comparable to or better than reference antimalarial drugs were selected for further synthesis and anti-malarial evaluation. ADMET analysis indicated favourable drug-like properties, acceptable oral bioavailability, and low predicted toxicity for the most promising candidates.

Conclusion: The in-silico findings suggest that selected 2,3-dihydroquinazolin-4(1H)-one derivatives possess significant potential as antimalarial agents. These compounds were further synthesized and *in vitro* and *in vivo* investigations was carried out to validate their therapeutic efficacy and safety.

Keywords: 2,3-Dihydroquinazolin-4(1H)-one, Antimalarial agents, In-silico evaluation.

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NATURAL TUBER STARCH: EXTRACTION, CHARACTERIZATION AND THIOLATED MODIFICATION FOR NOVEL DRUG DELIVERY SYSTEMS

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ABSTRACT

Background: Natural polymers have gained significant attention in novel drug delivery systems due to their biocompatibility, biodegradability, and non-toxicity. Tuber starch, an abundant and renewable polysaccharide, possesses excellent swelling, hydration, and film-forming properties. However, native starch often exhibits limited mucoadhesion and controlled release capability. Chemical modification, particularly thiolation, enhances functional properties by introducing thiol groups that improve mucoadhesive strength and drug retention, making it a promising candidate for advanced drug delivery applications.

Objective*:* The present study aimed to extract natural starch from tuber source (Bengal arum), evaluate its physicochemical and structural characteristics, and modify it through thiolation to develop a potential polymer for novel controlled drug delivery systems.

Methods*:* Starch was extracted from Bengal arum tubers using aqueous extraction followed by filtration, sedimentation, and drying. The yield was calculated, and organoleptic properties were assessed. Characterization included identification and purity testing, determination of melting point, moisture content, pH, hydration capacity, and swelling index. Surface morphology was evaluated, and structural confirmation was performed using FTIR spectroscopy. Thiolation of starch was carried out using an appropriate thiolating agent under controlled conditions. The modified starch was further characterized for thiol content, swelling behavior, and compatibility for drug delivery applications.

Results*:* The extracted starch showed a percentage yield of 11.86%. It appeared as a off white colored, odorless, and fine powder with a melting point of 256±2.1°C, moisture content of 1.33±1.4%, and pH of 6.1±0.3. Hydration capacity and swelling index were found to be 2.301±0.19 and 2.67±0.5, respectively. FTIR analysis confirmed characteristic starch peaks. Successful thiolation was indicated by the thiol content of 0.679% and degree of substitution 0.035.

Conclusion*:* The findings suggest that thiolated Bengal arum tuber starch exhibits enhanced functional properties compared to native starch and holds significant potential as a polymeric carrier in novel controlled drug delivery systems.

Keywords: Natural starch, Thiolation, Characterization, Controlled drug delivery.

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SYNTHESIS, *IN VITRO* AND *IN SILICO* ANTIMALARIAL ACTIVITY EVALUATION OF COUMARIN-CHALCONE HYBRID

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ABSTRACT

Background: Malaria is one of the oldest and most wide spread diseases in the world, affecting the population living in tropical and subtropical area caused by *Plasmodium falciparum* and *Plasmodium vivax***.** There is confirmed resistance of both species against most of currently available anti-malarial drugs. Hybrid drug design has emerged as a promising strategy in modern antimalarial drug discovery, integrating two pharmacophores into a single molecular framework to enhance biological activity and overcome resistance mechanisms. Coumarin and chalcone scaffolds are well known for their diverse pharmacological properties, including promising antimalarial activity. Coumarin function as antimalarials primarily by inhibiting the malaria parasite's DNA gyrase which leads to single-stranded DNA breaks and inhibits the replication of the parasite's apicoplast. They also act by inhibiting the hemozoin formation and carbonic anhydrase enzymes, disrupting parasite metabolism. Whereas Chalcone based antimalarials act primarily by inhibiting hematin polymerization in Plasmodium parasites, causing a buildup of toxic heme particularly in the trophozoite stage. They utilize a Michael acceptor mechanism (unsaturated ketone bridge) to trigger oxidative stress, distrupting parasite membranes and metabolism.

Objective: The present study aimed to synthesize a novel coumarin–chalcone hybrid in which the B ring of the chalcone moiety was replaced by an imidazole ring and evaluate its antimalarial potential through *In vitro* and In-Silico approach to identify promising lead compounds with enhanced activity and favorable pharmacokinetic properties.

Method: A coumarin–imidazole based chalcone was synthesized in two steps using Knorevengel condensation and Claisen Schmidt condensation reaction which was then characterized by melting Point, IR, Mass Spectroscopy. *In vitro* antimalarial screening was done against both Plasmodium Falciparum resistant and sensitive strain by Geimsa-staining method through which the IC_{50} value of the compound was determined. Molecular docking studies were performed to investigate the binding interactions of the compound with various parasitic protein targets.

Result and Conclusion: The synthesized hybrid demonstrated significant antiplasmodial activity exhibiting promising IC_{50} values compared to standard drugs. Molecular docking studies revealed strong binding interactions with essential parasite targets, supporting their potential mechanism of action. ADMET analysis indicated favorable drug-likeness properties and acceptable toxicity profiles for the most active derivatives. Apart from the antimalarial activity of the two Pharmacophore the imidazole ring is predicted behaves as a Fe(III) axial ligand and inhibit β-hematin formation and reported promising *in vitro* (against both sensitive and resistant strain) and *in vivo* antimalarial activities. The combination of these two pharmacophores into a single molecular framework and incorporating an imidazole ring into the hybrid may lead to synergistic effects and improved therapeutic efficacy.

Keywords: Coumarin, chalcone, antimalarial, in-silico**.**

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FROM PHYTOCHEMISTRY TO PHARMACOLOGY: BIOLOGICAL SIGNIFICANCE OF *Garcinia cowa* ROXB

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ABSTRACT

Background: *Garcinia cowa* Roxb. is a widely distributed edible medicinal plant in tropical regions, traditionally used in culinary preparations and folk medicine. Reports indicate the presence of various phytoconstituents, including xanthones, flavonoids, organic acids, and vitamins. Organic acids such as citric acid, malic acid, tartaric acid, oxalic acid, and acetic acid have been found, whereas hydroxycitric acid is not present in this species. Along with vitamin C (the most prevalent vitamin), the fruits include vitamins B1, B2, B3, and B12. These constituents are linked to nutritional value and pharmacological potential.

Objective: To gather and assess the documented phytochemical components and biological activities of *Garcinia cowa* to comprehend its significance in medicine and nutraceuticals.

Methods: Analyses were conducted of previously published phytochemical and pharmacological studies on *Garcinia cowa*. Constituents reported were categorized into organic acids, xanthones, flavonoids, and vitamins, with their biological properties interpreted based on documented experimental findings.

Results: The plant comprises substantial amounts of organic acids that contribute to its flavour and preservation characteristics. The main organic acid detected was citric acid, with malic acid and other acids occurring in lesser quantities. The main vitamin identified was ascorbic acid. Xanthone derivatives isolated from various parts of plants have shown antioxidant, antibacterial, anti-inflammatory, antimalarial, and cytotoxic properties. The fruit's sweeter taste, in comparison to other Garcinia species, can be attributed to its relatively low total acidity.

Discussion: The variety of phytochemicals suggests that *Garcinia cowa* has both nutritional and therapeutic roles. While vitamins and xanthones bolster antioxidant and pharmacological activities, organic acids affect organoleptic properties and antimicrobial stability. Thus, the plant serves as a promising natural reservoir of bioactive compounds that could be utilized in food preservation and drug development. Its effectiveness as a treatment needs to be confirmed through additional experimental and clinical research.

Keywords: *Garcinia cowa*, Xanthones, Organic acids, Pharmacological activity.

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ANTIDIABETIC AND HYPOLIPIDEMIC ACTIVITY OF AMMOIDIN: AN *IN SILICO, IN VITRO* APPROACH IN STZ- INDUCED DIABETIC RAT MODEL

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ABSTRACT

Background: The increasing global prevalence of type 2 diabetes mellitus (T2DM) and associated complications such as hyperlipidemia highlights the need for safer, plant-derived therapeutic agents. Natural bioactive compounds offer potential alternatives with fewer side effects.

Objectives: To evaluate the antidiabetic and hypolipidemic potential of Ammoidin, a furanocoumarin isolated from *Ammi majus*, using in silico, *in vitro*, and *in vivo* approaches.

Methods: In silico analyses (molecular docking, target prediction, and network pharmacology) were conducted to identify key protein targets and pathways associated with T2DM. *In vitro* assays assessed α-amylase and α-glucosidase inhibition, along with antioxidant activity using DPPH, FRAP, nitric oxide, and superoxide scavenging assays. *In vivo* efficacy was evaluated in streptozotocin-induced diabetic rats by monitoring blood glucose, lipid profiles, and histopathological changes in liver and pancreatic tissues. Acute toxicity studies were also performed.

Results: Computational studies identified significant interactions with diabetes-related molecular targets. Ammoidin exhibited strong α-amylase and α-glucosidase inhibitory activity and demonstrated notable antioxidant capacity. In diabetic rats, treatment significantly reduced blood glucose levels, improved lipid profiles, and restored normal liver and pancreatic histology. No acute toxicity was observed at therapeutic doses. Histopathological findings confirmed organ-protective effects.

Conclusion: Ammoidin shows promising dual antidiabetic and hypolipidemic activity, supported by computational, biochemical, and *in vivo* evidence. Its safety profile and organ-protective effects suggest potential as a novel phytopharmaceutical candidate for T2DM and hyperlipidemia management. Further clinical and mechanistic investigations are recommended.

Keywords: Ammoidin, α-amylase inhibition, α-glucosidase inhibition, Antioxidant activity, Network pharmacology, Streptozototocin-induced diabetes, Phytopharmaceutical.

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FORMULATION AND EVALUATION OF FAST DISSOLVING ORAL FILM USING SILYMARIN AND YOHIMBINE

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ABSTRACT

Background: Fast-dissolving oral films (FDOFs) have emerged as an innovative drug delivery system designed to enhance bioavailability and improve patient compliance, particularly in paediatric, geriatric, and dysphagic populations. Silymarin, a flavonolignan derived from Silybum marianum, exhibits potent antioxidant and anti-inflammatory properties but suffers from poor oral bioavailability. Yohimbine, a naturally occurring indole alkaloid, also demonstrates significant pharmacological and anti-inflammatory activity. Incorporation of these agents into FDOFs may enable rapid onset of action and improved therapeutic efficacy.

Objective*:* The present study aimed to formulate and evaluate FDOFs containing Silymarin and Yohimbine using a Quality by Design (QbD) approach to optimize formulation variables and ensure consistent product performance.

Methods: Films were prepared by the solvent casting method using Hydroxypropyl Methylcellulose (HPMC) as the film-forming polymer and Polyethylene Glycol 400 (PEG 400) as the plasticizer. Preformulation studies included physicochemical compatibility, solubility assessment, and UV absorption analysis. The prepared films were evaluated for thickness, folding endurance, surface pH, and drug content uniformity. *In vitro* drug release studies were conducted using a Franz diffusion apparatus. Anti-inflammatory activity was assessed by the egg albumin denaturation assay. Drug release kinetics were analyzed using Korsmeyer–Peppas and Higuchi models.

Results: The formulated films demonstrated satisfactory mechanical strength, uniform drug distribution, and acceptable surface pH. *In vitro* studies showed efficient and controlled drug release. Significant inhibition of protein denaturation confirmed the anti-inflammatory potential of the combined drug-loaded films. Drug release kinetics followed the Korsmeyer–Peppas and Higuchi models, indicating a non-Fickian diffusion mechanism.

Conclusion: The developed FDOFs containing Silymarin and Yohimbine represent a promising oral drug delivery platform, offering enhanced bioavailability, rapid therapeutic action, and improved patient compliance.

Keywords: Fast-dissolving oral films, Silymarin, Yohimbine, Quality by Design (QbD).

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ISOLATION AND CHARACTERIZATION OF RESISTANT STARCH FROM PARBOILED RICE OF ASSAM (*UKHUA CHAWL*) FOR COLON-TARGETED DRUG DELIVERY APPLICATIONS

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ABSTRACT

Background: Resistant starch is a retrograded starch fraction that escapes digestion in the upper gastrointestinal tract and undergoes selective fermentation by gut microbiota in the colon. Because of this unique digestion pattern, it can be considered as a promising natural polymer for colon-targeted drug delivery systems.

Objective: The present study aimed to isolate resistant starch from locally available parboiled rice of Assam and to evaluate its physicochemical and structural properties to assess its suitability as a carrier for colon-specific drug delivery.

Method: Resistant starch was isolated using the alkaline deproteination method. The percentage yield was calculated, and the isolated starch was evaluated for its organoleptic properties, solubility profile, pH, swelling index, water-absorption index, and moisture content. Thermal properties were analyzed using Differential Scanning Calorimetry (DSC). Functional group and structural characterization were carried out using Fourier Transform Infrared Spectroscopy (FT-IR), X-Ray Diffraction (XRD), and Scanning Electron Microscopy (SEM).

Results and Conclusion: The isolation process produced a 41.17% yield of resistant starch. The obtained sample was white and amorphous in appearance. It was insoluble in cold water and most organic solvents, but showed partial solubility in hot water. The starch exhibited no swelling behavior, demonstrated good water absorption capacity, maintained a near-neutral pH, and showed a gelatinization temperature range of 74–112°C. FT-IR analysis confirmed the presence of characteristic starch functional groups, XRD revealed a crystalline structure linked to enzymatic resistance, and SEM images showed intact and well-defined starch granules. These findings suggest that the isolated resistant starch possesses suitable structural and physicochemical properties for further pharmaceutical applications.

Keywords: Resistant starch, Parboiled rice, Natural polymer, Colon-targeted delivery system.

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SURFACE-ENGINEERED ARECA NUT HUSK-DERIVED NANOCELLULOSE HYDROGEL PATCHES FOR WOUND MANAGEMENT: A REVIEW

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ABSTRACT

Background: Effective wound management requires rapid bleeding control, prevention of microbial infection, and maintenance of a moist healing environment. Conventional wound dressings mainly function as passive barriers and often lack intrinsic hemostatic and antimicrobial activity, leading to delayed healing and increased risk of infection. Nanocellulose-based hydrogels have gained attention due to their high surface area, biocompatibility, and tunable surface chemistry. Areca nut husk, an abundant agro-waste material, offers a sustainable and underutilized source of nanocellulose for biomedical applications.

Objective: This review aims to evaluate surface-engineered nanocellulose hydrogels derived from areca nut husk as multifunctional wound dressings, with particular emphasis on their hemostatic efficiency, antimicrobial performance, and wound-healing potential.

Methods: This review analyzes reported strategies for enhancing wound-healing performance of nanocellulose-based hydrogel patches through surface engineering and multifunctional integration. Literature focusing on areca nut husk–derived nanocellulose is examined with emphasis on surface modification techniques such as oxidation and cationic functionalization to improve blood interaction, hydrogel network reinforcement, and moisture retention. Studies incorporating plant-based silver nanoparticles into nanocellulose hydrogels are reviewed to understand synergistic antimicrobial mechanisms, controlled silver release, and biocompatibility.

Results & Conclusion: Surface-engineered nanocellulose hydrogels exhibit enhanced surface charge, hydrophilicity, and active binding sites, resulting in improved platelet adhesion, rapid clot formation, and efficient exudate absorption. Incorporation of plant-mediated silver nanoparticles provides controlled, broad-spectrum antimicrobial activity while maintaining biocompatibility. Together, the nanocellulose scaffold supports hemostasis, moisture retention, and mechanical stability, while silver nanoparticles reduce bacterial burden, collectively accelerating wound closure and tissue regeneration. The synergistic integration within a hydrogel patch represents a sustainable and multifunctional approach for advanced wound care.

Keywords: Surface-engineered nanocellulose, Areca nut husk, Hydrogel patch, Wound healing applications

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SYNTHESIS AND ANTIMALARIAL EVALUATION OF ARTEMISININ-LINKED 1,3,5-TRISUBSTITUTED TRIAZINE DERIVATIVES

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ABSTRACT

Background: Malaria is a life-threatening disease worldwide, more than 300 to 500 million individuals worldwide are infected with Plasmodium species, and 1.5 to 2.7 million people a year, most of whom are children, die from the infection. The World Health Organization presently recommends the Artemisinin-based combination therapies (ACTs) as the first line treatment for uncomplicated malaria, which involve combining a semi-synthetic Artemisinin derivative with another drug of a different chemical class. Using artemisinin alone exposes parasites to sub-lethal drug concentration, which encourages the development of artemisinin-resistant strains. That is why artemisinin is always used as ACT therapy, paired with longer-acting antimalarial, the parent drug clears remaining parasites and provides prolonged protection. The current study uses 2,4,6-trichloro-1,3,5-triazine as the 2nd drug for the ACT therapy because of its antifolate mechanism which interfere with folate metabolism in malaria parasite.

Objective: The current study deals with the designing of novel molecules combining an artemisinin derivative with 2,4,6-trichloro-1,3,5-triazine where the chlorine atom of the triazine are substituted with different relevant amines. The molecules are then screened by in-silico studies and the top 20 molecules were selected for Synthesis which will further go for Characterization and antimalarial activity.

Methods: The 2,4,6-trichloro-1,3,5-triazine molecule undergoes substitution in three different stages, where its chlorine atom gets substituted with different relevant amines. The first substitution is done at 0ºC, the 2nd substitution at RT or 40-50 º C and the third substitution at 100 ºC or above. The artemisinin derivative was reacted with boron trifluoride diethyl etherate for 6-8 hours at room temperature to achieve ethylbromide derivative after that the 2,4,6-trisubstututed-1,3,5-triazine derivative is combined with the ethyl bromide derivative of artemisinin derivate at 80-90 º C for 6-12 hours.

Result: The in-silico evaluation of the designed molecules was carried out, and based on the molecular docking results, 20 top-ranking compounds were selected for synthesis. The substitution reaction of 2,4,6-trichloro-1,3,5-triazine is currently underway in the present phase of the study.

Conclusion: The series of hybrid molecules is currently under synthesis. Based on the molecular docking results, which demonstrated very promising binding interactions, these compounds are expected to exhibit significant antimalarial activity *in vitro.*

Keywords: Artemisinin-based combination therapies, World Health Organization, 2,4,6-trichloro-1,3,5-triazine, antimalarial activity, artemisinin.

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DEVELOPMENT OF AN UPLC-HRMS ANALYTICAL METHOD TO IDENTIFY STRESS DEGRADANTS OF PROGESTERONE

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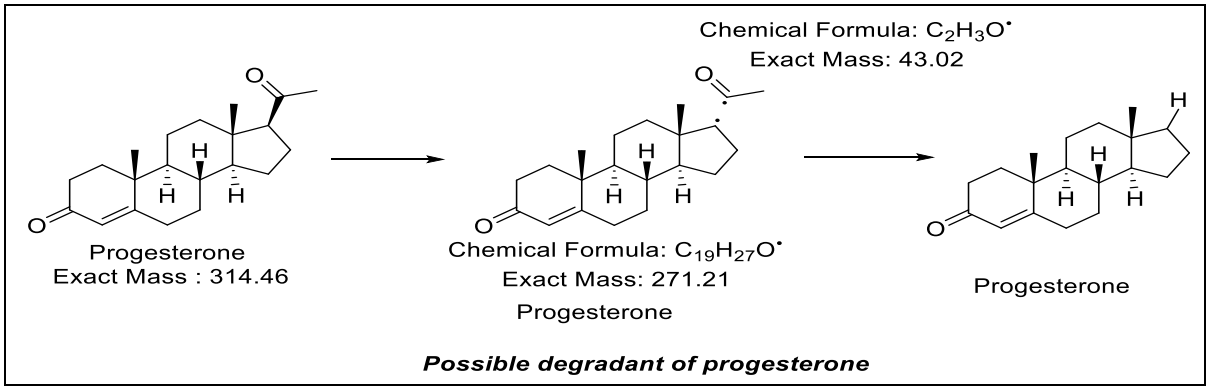
ABSTRACT

Background: Progesterone is a steroidal hormone that plays an important role in regulating reproductive health in women, used in hormone replacement therapy, contraception, and the management of various gynecological disorders. Due to its therapeutic significance, the development of a stability-indicating analytical method is essential to ensure quality, safety, and efficacy during its storage and transport.

Objective: To develop and validate a stability-indicating, highly sensitive LCMS Q-TOF method for the estimation of progesterone and to characterize its degradants under various stress conditions as per ICH guidelines.

Methods: An Agilent 1290 Infinity II LC, and Agilent 6546 LC/Q-TOF was used for separation and estimation of progesterone and its degradants using a UPLC ZORBAX Eclipse Plus C-18 column (100 × 2.1 mm, 1.8 µm) with a mobile phase consisting of LC-MS grade water and acetonitrile, both containing 0.1% formic acid, at a flow rate of 0.5 mL/min, with a runtime of 8 minutes. Agilent Mass Hunter Acquisition 10.1 software was used for data acquisition. The method was validated for linearity (10-1000 ng/mL), precision, accuracy, limit of detection (LOD), limit of quantification (LOQ), and robustness. Forced degradation studies were conducted under acidic, alkaline, oxidative, and thermal stress conditions as per ICH guidelines.

Result and Conclusion: The obtained retention time of the progesterone is found to be 3.14 minutes. The progesterone calibration curve shows good linearity over the concentration range of 10-1000 ng/mL, with an excellent correlation coefficient (R^2=0.999). The method showed acceptable linearity within the specified range and satisfactory precision, accuracy, sensitivity, and robustness. Forced degradation studies demonstrated the formation of degradation products, which were detected by the developed method, confirming its stability-indicating capability. The proposed method is rapid, reliable, and suitable for routine quality control analysis of progesterone and its marketed formulations. The possible alkaline degradant was identified from its HRMS value as given below.



Possible degradant of progesterone

Keywords: *Progesterone*, LC-MS, Stability-indicating method development, Validation, ICH, Forced Degradation.

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SYNTHESIS AND ANTINEOPLASTIC EVALUATIONS OF MEDIUM CHAIN FATTY ACID CONJUGATES OF CAFFEIC ACID AND FERULIC ACID

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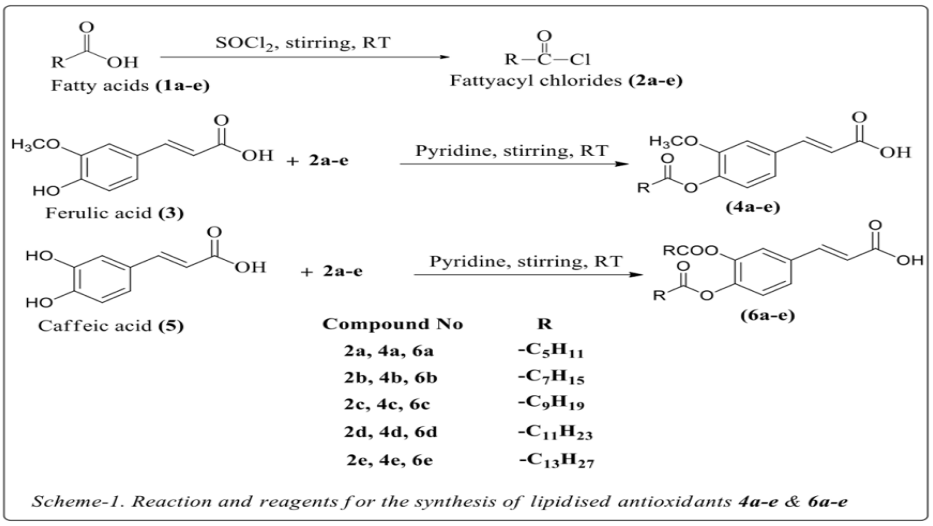
ABSTRACT

Background: Safe and effective anticancer drug discovery remains a significant challenge for medicinal chemists. Phenolic metabolites like ferulic and caffeic acids possess promising antioxidant and pharmacological properties against various cancers. However, rapid peripheral metabolism, glycosylation of the phenolic -OH group, and low lipophilicity severely limit their *in vivo* efficacy and clinical application. On the other hand, medium chain fatty-acids have the ability to ameliorate cancer cells due to their intrinsic property to alter the tumor microenvironment and apoptosis inducing ability.

Objective: To overcome the biological limitations of phenolic metabolites by lipidizing them with medium chain fatty-acids to produce enhanced anticancer efficacy.

Methods: Fatty acid conjugates of ferulic (Series-1) and caffeic (Series-2) acids were synthesized employing Schotten-Baumann reaction (Scheme 1). The resulting compounds were structurally characterized using FT-IR, ^{1}H NMR, ^{13}C NMR, and ESI-HRMS. Antiproliferative activity was evaluated against human breast (MCF-7) and lung (H460) cancer cell lines, while general cytotoxicity was assessed using RAW 264.7 murine macrophages.



*Scheme-1. Reaction and reagents for the synthesis of lipidised antioxidants **4a-e** & **6a-e***

Results: Series-1 conjugates exhibited favorable anticancer and safety profiles. The compounds 4b, 4d, 4e and 6a showed broad-spectrum activity against both cancer lines at a concentration of 200 µg/mL whereas 4c was selectively active against H460 (206.26 µg/mL).

Conclusion: This present lipidization strategy enhance the antiproliferative activity with lower toxicity, validating the approach for developing viable anticancer agents.

Keywords: Fatty acid conjugates, ferulic acid caffeic acid, anticancer, medium chain fatty acids.

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IN SILICO STUDY OF A NOVEL HYDROXYQUINOLINE–TRIAZINE DERIVATIVE AS A POTENTIAL ANTI-ALZHEIMER'S AGENT

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ABSTRACT

Background: Alzheimer's disease (AD) is a multifactorial neurodegenerative disorder characterized by progressive cognitive impairment and cholinergic dysfunction. Acetylcholinesterase (AChE) plays a critical role in the hydrolysis of acetylcholine, and its dysregulation is a key pathological feature of AD. Therefore, the development of novel AChE inhibitors remains an important therapeutic strategy.

Objective: This study aimed to design and evaluate novel hydroxyquinoline–1,3,5-triazine hybrid derivatives as potential AChE inhibitors using computational approaches.

Methods: A library of 60 hydroxyquinoline–1,3,5-triazine derivatives incorporating diverse heterocyclic substituents was rationally designed. All compounds were subjected to molecular property evaluation, ADME profiling, and toxicity prediction to assess drug-likeness and pharmacokinetic suitability. Molecular docking studies were performed against AChE (PDB ID: 1EVE) to analyze binding affinity and interaction patterns. Based on docking scores and pharmacological parameters, six compounds (14, 15, 32, 45, 48, and 52) were shortlisted for detailed interaction analysis.

Results and Conclusion: Among the selected candidates, compound 52 exhibited the most favorable binding affinity (–377.90362 kcal/mol), comparable to the reference drug donepezil. Detailed interaction analysis revealed π–π T-shaped and stacked interactions with TRP A:84, PHE A:330, and TYR A:334, along with amide–π interaction with HIS A:440. Multiple hydrogen bonds were also observed involving TYR A:121, SER A:122, ASP A:72, and GLU A:199. The combined docking performance and favorable ADME–toxicity profile suggest that hydroxyquinoline–1,3,5-triazine hybrids, particularly compound 52, represent promising scaffolds for further optimization as potential therapeutic agents against Alzheimer's disease.

Keywords: Alzheimer's disease, Acetylcholinesterase (AChE), Hydroxyquinoline, 1,3,5-triazine

Funding: NA

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FORMULATION DEVELOPMENT AND EVALUATION OF POLY-HERBAL ANTHELMENTIC TABLET CONTAINING *Melastoma malabathricum* (Lam.) AND *Jasminum sambac* (Lam.)

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ABSTRACT

Background: Helminth infections remain a global health challenge, particularly in resource-limited settings. Traditional medicinal plants like *Melastoma malabathricum* L. and *Jasminum sambac* L. offer promising anthelmintic properties due to their rich phytochemical profiles, warranting modern formulation for efficacy and safety.

Objectives: To formulate and evaluate poly-herbal anthelmintic tablets using ethanolic leaf extracts of *M. malabathricum* and *J. sambac,* optimize via design of experiments, and assess in vitro anthelmintic activity against *Pheretima posthuma*.

Methods: Authenticated leaves were shade-dried, extracted with ethanol, and screened for phytochemicals (alkaloids, flavonoids, tannins, phenols, glycosides, terpenoids). Extracts underwent in vitro anthelmintic testing. Tablets were prepared by wet granulation with varying excipients, optimized using Central Composite Design. Evaluations included pre-formulation flow properties, post-formulation hardness, friability, disintegration, and in vitro activity.

Results: Extracts showed dose-dependent paralysis and death times comparable to albendazole. The optimized batch exhibited excellent mechanical strength (hardness, low friability), rapid disintegration, and significant anthelmintic efficacy, highlighting extract synergy.

Conclusion: This study validates the potential of *M. malabathricum* and *J. sambac* extracts in safe, effective poly-herbal anthelmintic tablets, supporting their development as affordable alternatives to synthetic drugs.

Keywords: *Melastoma malabathricum*, *Jasminum sambac*, Polyherbal tablet, Anthelmentic activity, *Pheretima posthuman.*

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DEEP EUTECTIC SOLVENT (DES)-INTEGRATED NANOCARRIERS: A NEW FRONTIER IN DRUG DELIVERY

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ABSTRACT

Background: Conventional drug delivery systems often face challenges such as poor solubility of active pharmaceutical ingredients, low bioavailability, formulation instability, and limited targeting efficiency. Nanocarrier-based drug delivery systems have significantly improved therapeutic outcomes, however, optimization of drug loading and release behaviour remains a critical concern. Deep eutectic solvents (DES), a class of tunable and green solvent systems, have recently emerged as functional excipients capable of enhancing drug solubility, stability, and permeability.

Objective: The objective of this review is to critically analyze recent advances in DES-integrated nanocarriers and to highlight their role as a novel strategy for improving drug delivery performance.

Methods: A systematic literature review was conducted to analyze recent advancements in deep eutectic solvent (DES)-based drug delivery systems. Relevant peer-reviewed articles were retrieved from established scientific databases, including PubMed, Scopus, Web of Science, and ScienceDirect, using keywords such as "deep eutectic solvents," "DES-integrated nanocarriers," and "drug delivery." Publications from the past decade were primarily considered. Studies focusing on DES-incorporated lipid, polymeric, and hybrid nanocarriers were critically evaluated with respect to formulation strategies, physicochemical properties, drug loading efficiency, release behavior, and biological performance. The collected data were systematically assessed to identify current trends, advantages, and limitations of DES integration in nanocarrier design.

Results and Conclusion: The reviewed literature indicates that integration of DES into nanocarriers enhances the solubility of poorly water-soluble drugs and improves encapsulation efficiency. DES-based systems demonstrate improved stability, controlled drug release, and enhanced permeation across biological barriers. Their customizable composition and potential biocompatibility provide formulation flexibility, with several studies reporting improved therapeutic efficacy and reduced toxicity compared to conventional nanocarriers. DES-integrated nanocarriers represent a promising and innovative approach in modern drug delivery science. By acting as multifunctional components rather than mere solvents, DES enable improved drug loading, stability, and release control within nanocarrier systems. This review highlights DES-based nanocarriers as a new frontier in drug delivery, with strong potential for future pharmaceutical development.

Keywords: Deep eutectic solvents (DES), Nanocarriers, Drug delivery systems, Lipid nanoparticles, Drug solubility enhancement, Controlled drug release.

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SYNTHESIS OF SOME NEWER STEROIDAL ACYL HYDRAZIDES AS ANTI-COLON CANCER AGENTS

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ABSTRACT

***Background*:** Cancer remains a primary global health challenge, necessitating the continuous development of novel chemotherapeutic agents with enhanced potency and tissue selectivity. Steroids are recognized as "privileged scaffolds" in medicinal chemistry due to their diverse biological profiles, particularly their significant antiproliferative properties against colon cancer.

***Objectives*:** The primary objective of this study was to design, synthesize, and characterize a novel series of steroidal acyl hydrazide analogues. Furthermore, the research aimed to evaluate the in vitro antiproliferative potential of these compounds against the HCT-116 human colon cancer cell line to identify lead candidates against colon cancer.

***Methods*:** The acyl hydrazide analogues were synthesized by reacting isoniazid with steroid derivatives in a medium of methanol and catalysed by glacial acetic acid as given in scheme 1. The compounds were purified by column chromatography, and structures were established by FTIR, HRMS, ^{1}H and ^{13}C NMR. The antiproliferative efficacy of the steroid derivatives were assessed using the HCT-116 cell line, determining the half-maximal inhibitory concentration (IC_{50}) for each compound.

***Results*:** All synthesized compounds demonstrated measurable antiproliferative activity against **HCT-116 cells**. Notably, two steroidal acyl hydrazides (PA-106, and PA-107) emerged as the most effective inhibitors with IC_{50} values of 0.1 µg/ml. This suggests that specific substitution patterns on the steroid frameworks significantly enhance bioactivity.

***Conclusion*:** The study successfully identified PA-106 and PA-107 as highly potent antiproliferative agents against colon cancer. These findings underscore the potential of steroid-linked acyl hydrazides as promising scaffolds for further structural optimization in the pursuit of novel colorectal cancer therapies.

Keywords: Steroidal acyl hydrazides, isoniazid, HCT-116, anti-colon cancer activity.

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EVALUATION OF FARNESOL AS A POTENTIAL THERAPEUTIC AGENT IN DIABETIC NEPHROPATHY USING NETWORK PHARMACOLOGY AND MOLECULAR DOCKING

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ABSTRACT

***Background*:** Diabetic nephropathy (DN) is a major microvascular complication of diabetes mellitus and a leading cause of chronic kidney disease and end-stage renal failure worldwide. Persistent hyperglycemia promotes oxidative stress, inflammation, insulin resistance, and profibrotic signaling, resulting in glomerular damage and progressive renal dysfunction. Current treatments mainly focus on glycemic and blood pressure control, with limited multi-target options. Farnesol, a natural bioactive compound, exhibits antioxidant, anti-inflammatory, and cytoprotective properties, suggesting potential therapeutic value in DN management.

***Objective*:** To investigate the potential nephroprotective mechanisms of farnesol against diabetic nephropathy through integrated approach by network pharmacology and molecular docking.

***Methods*:** Potential protein targets of farnesol were obtained from SwissTargetPrediction, and DN-associated genes were obtained from GeneCards. Venny 2.1 to find common targets. The Protein-Protein Interaction (PPI) network was created using STRING, and hub genes were identified using topological properties in Cytoscape software. Functional enrichment analysis (Gene Ontology and KEGG pathway analysis) was performed using ShinyGO to identify important biological processes and pathways. Molecular docking analysis was performed using AutoDock Vina to analyze binding interactions between farnesol and target hub proteins. ADMET and toxicity predictions were performed using SwissADME and ProTox-III software

***Results*:** A total of 67 overlapping targets were identified. Network analysis highlighted AKT, MTOR, MAPK14, GSK3B, PPARA, EGFR, and PTGS2 as central hub proteins. Enrichment analysis revealed significant involvement in phosphorylation-mediated signaling, inflammatory response, apoptosis regulation, and metabolic stress pathways. KEGG pathway analysis emphasized the insulin resistance pathway as a major regulatory mechanism. Docking studies supported stable binding interactions, and ADMET evaluation indicated favorable drug-likeness with low predicted toxicity.

***Conclusion*:** Farnesol can demonstrate nephroprotective activity in diabetic nephropathy by multi-target modulation of insulin resistance, oxidative stress, and inflammation pathways. Further experimental validation is required to confirm its therapeutic potential.

Keywords: Diabetic nephropathy, Farnesol, Network pharmacology, Molecular Docking

Funding: NA

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EVALUATION OF ANTI-ARTHRITIC POTENTIAL OF METHYL VANILLATE, A PLANT-DERIVED BIOACTIVE COMPOUND: AN *IN SILICO* APPROACH

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ABSTRACT

Background: Rheumatoid arthritis (RA) is a chronic systemic autoimmune inflammatory disorder characterized by synovial inflammation, cartilage degradation, and progressive joint destruction. Existing therapies such as disease-modifying Antirheumatic drugs (DMARDs) and biologics are associated with adverse effects and limited long-term efficacy, highlighting the need for safer and effective therapeutic agents. Plant-derived phenolic compounds have shown promising anti-inflammatory and antioxidant properties, making them potential candidates for RA management.

Objective: The present study aims to evaluate the anti-rheumatic potential of methyl vanillate, a plant-derived bioactive compound, using in silico studies.

***Methods*:** A comprehensive literature survey and network pharmacology analysis was conducted to identify bioactive phytoconstituents and their potential molecular targets associated with RA. Protein–protein interaction (PPI) networks, Gene Ontology, and KEGG pathway enrichment analyses were performed to elucidate the underlying molecular mechanisms. Molecular docking studies were carried out to validate the binding affinity of methyl vanillate with key inflammatory targets. In vitro antioxidant and anti-inflammatory assays and in vivo anti-arthritic studies were planned to evaluate pharmacological efficacy. ADME and toxicity prediction studies were also conducted to assess drug-likeness and safety.

Results: Network pharmacology analysis identified multiple overlapping therapeutic targets involved in inflammatory and immune regulatory pathways. Methyl vanillate showed strong binding affinity with key hub proteins and favourable ADME properties with no predicted nephrotoxicity, cytotoxicity, immunotoxicity, mutagenicity, or carcinogenicity. Functional enrichment analysis suggested that the compound may exert anti-arthritic effects through modulation of inflammatory signaling pathways and osteoclast differentiation.

Conclusion: Methyl vanillate demonstrated promising multi-target anti-arthritic potential with favourable safety and pharmacokinetic profiles. These findings suggest that methyl vanillate could serve as a potential natural therapeutic candidate for RA.

Keywords: Rheumatoid arthritis, Methyl vanillate, Network pharmacology, Molecular docking.

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IN SILICO NETWORK PHARMACOLOGY AND MOLECULAR DOCKING STUDY OF 4-ISOPROPYLPHENOL AGAINST DIABETIC NEPHROPATHY

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ABSTRACT

Background: Diabetic nephropathy (DN) is one of the most important microvascular complications in DM that is mainly driven by oxidative stress and inflammation leading to renal fibrosis. Therapies currently available prolong disease progression but do not reverse renal injury, indicating that multi-target therapeutic agents are needed.

Objectives: To explore the molecular mechanisms, and therapeutic potential of 4-isopropylphenol towards diabetic nephropathy in detail using network pharmacology, molecular docking, and in silico safety assessment.

Methods: SwissTargetPrediction was used to predict the targets of 4-isopropylphenol, and DN-related genes were obtained from GeneCards. Venny was used for identifying common targets and STRING-based protein–protein interaction (PPI) networks were analyzed. Cytoscape topological analysis was conducted to explore hub genes. Functional enrichment (GO and KEGG) was conducted via ShinyGO. The ligand–protein interactions were evaluated through molecular docking using AutoDock Vina. Pharmacokinetics, drug-likeness and toxicity were predicted using SwissADME and ProTox-III.

Results: 4-isopropylphenol and DN were found to have 57 set targets, overlapping with one another. Key hub genes, such as TNF, PTGS2 (COX-2), BCL2, ESR1 and PARP1 in the PPI network analysis. Enrichment analysis indicated enrichment for hormone signaling, oxidative stress response and inflammatory regulation with NF-κB signaling as a core mechanism. Molecular docking showed good binding affinities with PARP1 (−7.5 kcal/mol), GAPDH (−7.1 kcal/mol), TNF-α (−6.6 kcal/mol) and COX-2 (−6.3 kcal/mol). Utilizing ADMET predictions, compounds were further screened and predicted to have good oral bioavailability and drug-likeness with no toxic moieties.

***Conclusion*:** The in-silico discoveries indicate that 4-isopropylphenol has potential nephroprotective effects via multitarget regulation of inflammatory, oxidative and apoptotic pathways with especial emphasis on NF-κB signaling. These findings provide justification for further experimental validation of this compound as a potential therapeutic candidate for diabetic nephropathy.

Keywords: Diabetic nephropathy, 4-Isopropylphenol, Network pharmacology, Molecular docking

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IN-SILICO REPURPOSING OF PROBENECID AS A NOVEL NEPHROPROTECTIVE AGENT FOR DIABETIC NEPHROPATHY VIA NETWORK PHARMACOLOGY AND MOLECULAR DOCKING

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ABSTRACT

Background: Diabetic nephropathy (DN) is a major complication of diabetes that accounts for roughly half of all end-stage renal disease cases worldwide. Given that traditional therapies only partially mitigate risk, there is an urgent need for new interventions. Probenecid, a classic uricosuric agent, exhibits pleiotropic anti-inflammatory properties, presenting a promising candidate for drug repurposing in DN.

Objective: This study aims to systematically evaluate probenecid as a repurposed nephroprotective agent through an in-silico network pharmacology and molecular docking approach.

Methods: Potential targets for probenecid and DN were retrieved from SwissTargetPrediction and GeneCards databases. A protein-protein interaction (PPI) network of overlapping targets was constructed using STRING and analysed via Cytoscape to identify hub genes. Gene Ontology (GO) and KEGG pathway enrichments were performed using ShinyGO. Molecular docking was executed using AutoDock Vina to structurally validate the interactions. Pharmacokinetic and safety profiles were assessed using SwissADME and ProTox-III.

Results: Network analysis identified 26 common therapeutic targets. Topological analysis revealed critical hub genes, including MAPK1, MAPK8, MAPK14, MMP2, BCL2, and IL-8. KEGG enrichment highlighted the AGE-RAGE signaling pathway as the primary mechanism of action. Molecular docking confirmed strong binding affinities (<-6.0 kcal/mol) for these core targets, particularly MMP2 (-7.3 kcal/mol) and MAPK14 (-7.2 kcal/mol). ADMET profiling demonstrated a favorable safety profile with high gastrointestinal absorption and no major organ toxicity.

Conclusion: Probenecid demonstrates significant potential to mitigate DN by targeting the AGE-RAGE signaling cascade to suppress renal inflammation and fibrosis. These in silico findings establish a robust scientific rationale for repurposing probenecid, warranting subsequent in vitro and in vivo experimental validation.

Keywords: Diabetic nephropathy, Probenecid, Drug repurposing, Network pharmacology

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DEVELOPMENT AND EVALUATION OF ETOPOSIDE LOADED PROLIPOSOMAL DRY POWDER FOR LUNG CANCER

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ABSTRACT

Background: Lung cancer has grown significantly in prevalence over the past century. As per GLOBOCAN 2022, lung cancer topped globally with 2.48M cases and 1.82M deaths. In India, it ranked fourth with 81,748 cases and 75,031 deaths. There has been a resurgence in the drug delivery system for lung cancer therapy. Inspite of various developments in this area, a selective delivery system for certain chemotherapeutic agents is still lacking. Targeted therapy by proliposomes containing Etoposide could be a potential system for the efficient delivery of Etoposide to lungs.

Objective: This study aims to develop and evaluate novel Etoposide loaded proliposomes for the treatment of lung cancer.

Methods: Etoposide loaded proliposomes were prepared by slurry method using rotary vacuum evaporator. These were prepared using Etoposide, phospholipid and cholesterol as the lipid phase, a carrier and suitable solvent or mixture of solvents. The Proliposome formulations were optimized applying Box Behnken Design using Design Expert software. The optimized proliposome formulations were characterized for percentage yield, flow property. The reconstituted liposomes were evaluated for particle size, PDI, % entrapment efficiency, % drug loading, zeta potential, stability studies, drug release and release kinetics.

Results and conclusion:The obtained stable and free flowing Etoposide loaded proliposome powders were successfully reconstituted into homogenous liposomal vesicles. The reconstituted liposomal vesicles were evaluated in terms of particle size, polydispersity index (PDI), zeta potential, % drug entrapment efficiency and drug loading, stability, *in vitro* drug release study. The Etoposide loaded proliposomes were characterized for percentage yield, flow property. Hence, it can be concluded that proliposome loaded with Etoposide prepared by slurry method can be a promising, stable, safe and free-flowing system for the enhanced lung delivery of Etoposide.

Keywords: Etoposide, Proliposomes, Lung Cancer, Targeted Delivery.

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EMERGING STRATEGIES FOR TACKLING THE GLOBAL THREAT OF ANTIBIOTIC RESISTANCE

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ABSTRACT

***Background*:** Countless lives have been saved as a result of the discovery of antibiotics. Antibiotics have been classified into many classes according to their source, composition, and mode of action. Public health is increasingly being viewed as being threatened by increased antibiotic resistance in bacteria. Due to its ability to undermine the effectiveness of antibiotics and raise morbidity, mortality, and economic burden, antimicrobial resistance (AMR) has become one of the most urgent global health problems. Inadequate infection management, a declining supply of new medications, and the abuse and overuse of antibiotics in agriculture and healthcare have all contributed to the emergence of resistant infections. By 2050, AMR is expected to result in millions of fatalities per year if appropriate remedies are not implemented.

Objectives: This study aims to evaluate strategies combating antimicrobial resistance through stewardship, novel therapeutics, diagnostics, infection prevention, and global collaboration via One Health.

Methods: A systematic review of scientific literature, global health reports, and policy frameworks, including the WHO Global Action Plan, identified effective interventions and emerging approaches addressing antimicrobial resistance.

***Result and Conclusion*:** It is extremely difficult to do research on the use of antibiotics, the causes and evolution of antibiotic resistance, regional variations, and interventional techniques tailored to the specific health care environment of each nation. The situational analysis of antimicrobial resistance along with the solutions that will be needed in the future to lessen the problem's burden in developing nations like India has to be prioritized in order to overcome this global menace.

Keywords: Antimicrobial Resistance, Antibiotic, Mutation, Public Health

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PHYTOCHEMICAL INVESTIGATION &AMP, IN-SILICO BIOACTIVITY EVALUATION OF myrica esculenta BUCH.-HAM.EX D. DON BASED ON TRADITIONAL USES

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ABSTRACT

Background: *Myrica esculenta* Buch.-Ham.ex D. Don (ME) belonging to the family *Myricaceae* is a small evergreen dioecious tree, which fruit part is traditionally consumed raw or used to make refreshing drinks, and its juice is used by tribal communities of Meghalaya to treat diarrhoea & bacterial dysentery.

Objectives: The present study aims to identify various phytoconstituents & to scientifically validate the traditional claim of antidiarrheal activity along with antibacterial activity using in-silico approach.

Methods: Successive extraction of fruits of ME was carried out in Soxhlet apparatus using petroleum ether, chloroform, and hydro alcohol. Physicochemical & Preliminary phytochemical screening of all the extract were performed as per standard procedure. Further HRLCMS was performed for identification of compounds. For In-silico studies of identified compounds, Swiss ADME software, ProTox 3 & PyRx version 0.8, was used for molecular docking against selected target protein.

***Results*:** Phytochemical screening of fruits of *Myrical esculenta* confirmed the presence various group of phytochemicals like alkaloids, flavonoids, phenols & tannins. Furthermore, in-silico study revealed that the identified compounds exhibited good binding affinity against the selected protein indicating the potential anti-diarrhoeal & antibacterial properties of Myrica esculenta.

***Conclusion*:** The above study provides a preliminary insight in to the antidiarrheal and antimicrobial activity of *Myrica esculenta.* However, further in-vitro and in-vivo studies are required to confirm and validate the findings.

Keywords: Traditional use, Anti-diarrheal, Antibacterial molecular docking.

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SYNTHESIS AND *IN VITRO* EVALUATION OF NEW COUMARIN-ACETAMIDE-THIAZOLE DERIVATIVES AS POTENT INHIBITORS OF ACETYLCHOLINESTERASE AND BUTYRYLCHOLINESTERASE

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ABSTRACT

***Background*:** Alzheimer's, a multifactorial disease is marked by significant cholinergic impairment, which leads to the clinical manifestation of dementia. Nowadays, therapeutic strategies often focused on inhibiting acetylcholinesterase (AChE) and butyrylcholinesterase (BuChE) to elevate the acetylcholine levels.

***Objective*:** The present study focuses on developing a new class of hybrid inhibitors for Alzheimer's Disease by combining Coumarin and Thiazole scaffolds. In this study a pharmacophore hybridization technique is utilized to create molecules with enhanced potency, specificity and better therapeutic profiles.

***Method*:** In this study, a multistep approach was utilised designing 120 compounds library filtered via molinspiration for drug likeness and toxicity. The top 11 candidates underwent molecular docking against AChE and BuChE, followed by synthesis using Pechmann condensation and reaction with thiazole derivatives. Finally, in vitro Ellman's assays and 50 ns molecular dynamic simulations confirmed inhibitory activity and lead compound stability.

***Result*:** The prioritized compounds were synthesized via conventional methods and characterized using NMR, FT-IR and Mass Spectroscopy. In vitro evaluation using Ellman's method identifies 5b16 as a potent AChE inhibitor (IC_{50}= 2.00± 0.09µM) with a high selectivity index of 14.81, while 5c35 emerged as the most potent BuChE inhibitor (IC_{50}= 17.92± 0.42µM). The SAR (Structure Activity Relationship) analysis indicates that derivatives which originates from orcinol and 2-aminothiazole moieties generally bring out the higher inhibitory activity.

***Conclusion*:** The study signifies that hybridizing coumarin and thiazole derivatives by acetamide linkages produces a novel class of effective cholinesterase inhibitors. Specifically, derivatives derived from orcinol-based coumarin and 2-aminothiazole (like 5b16) provided the best inhibitory activity against AChE. These findings suggest that these hybrids are strong candidates for further development as potential anti-Alzheimer agents.

Keywords: Alzheimer's Disease, Acetylcholinesterase, Butyrylcholinesterase, Acetylcholine, Coumarin, thiazole.

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VANILLIC ACID AS A POTENT THERAPEUTIC CANDIDATE FOR RHEUMATOID ARTHRITIS: AN INTEGRATED DRUG DISCOVERY APPROACH

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ABSTRACT

***Background*:** Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disorder that primarily affects joints, leading to synovial hyperplasia, cartilage degradation, and progressive disability. Current pharmacological therapies, though effective, are often associated with significant side effects and high costs, necessitating the exploration of safer alternatives.

***Objective*:** This study aims to investigate the anti-arthritic potential of Vanillic acid, a phenolic compound, through an integrated approach involving in silico, in vitro, and in vivo methodologies.

***Methods*:** Network pharmacology and molecular docking were used to predict protein targets and pathways related to RA and also binding affinities, identifying strong interactions with key pro-inflammatory mediators implicated in RA pathogenesis. In vitro antioxidant activity of Vanillic acid was evaluated using DPPH radical scavenging and FRAP (Ferric Reducing Antioxidant Power) assays. Anti-inflammatory activity was assessed through HRBC membrane stabilization and protein denaturation assays. Acute oral toxicity was determined following standard toxicity protocols. In vivo anti-arthritic activity was investigated using a Complete Freund's Adjuvant (CFA)-induced arthritis model in Swiss albino mice. Paw swelling, joint thickness, and motor coordination were measured at predetermined time intervals to assess treatment effects.

***Results*:** Vanillic acid showed strong binding to key RA-related inflammatory targets and pathways. It demonstrated significant antioxidant and anti-inflammatory activity in vitro. In CFA-induced arthritic mice, it reduced paw swelling, joint damage, and inflammatory markers, confirmed by radiological and histopathological improvement.

***Conclusion*:** Overall, the findings suggest that Vanillic acid possesses promising therapeutic potential in the management of RA and could serve as a natural alternative or adjunct to existing treatments. Further clinical investigations are warranted to validate its efficacy and safety in humans.

Keywords: Anti-rheumatoid arthritis, anti-inflammatory, antioxidant, in silico, in vitro, in vivo, Vanillic acid.

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EXPLORING THE ANTI-RHEUMATIC POTENTIAL OF VALENCENE USING NETWORK PHARMACOLOGY AND MOLECULAR DOCKING APPROACHES

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ABSTRACT

Background: Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disease characterized by persistent synovial inflammation, joint damage, and progressive disability. Despite the availability of several therapeutic strategies, long-term treatment is often associated with adverse effects and incomplete disease control. Therefore, the identification of novel bioactive compounds with multi-target therapeutic potential has become an important area of research. Network pharmacology combined with molecular docking provides a systematic approach to understand the molecular mechanisms of potential anti-rheumatic compounds.

Objective: The present study aimed to investigate the potential anti-rheumatic mechanisms of valencene using an integrated network pharmacology and molecular docking approach to identify key molecular targets and signaling pathways involved in rheumatoid arthritis.

Methods: Physicochemical properties, drug-likeness, and toxicity of valencene were assessed using SwissADME and ProTox-II tools. Potential targets of valencene were predicted using SwissTargetPrediction, while RA-associated genes were obtained from the GeneCards database. Overlapping targets were identified using Venny. A protein–protein interaction network was constructed using STRING and analyzed through Cytoscape to determine key hub proteins. Gene Ontology and KEGG pathway enrichment analyses were performed using ShinyGO. Molecular docking studies were carried out using PyRx, and ligand–protein interactions were visualized with BIOVIA Discovery Studio.

Results: A total of 79 overlapping targets between valencene and RA-related genes were identified. PPI network analysis highlighted TNF, MAPK3 (ERK), and PPARG as major hub proteins associated with inflammatory regulation and bone metabolism. Functional enrichment analysis indicated significant involvement in inflammatory signaling, transcription regulation, and immune responses. KEGG pathway analysis revealed enrichment of pathways including PPAR signaling, adipocytokine signaling, steroid hormone biosynthesis, prolactin signaling, and osteoclast differentiation, with osteoclast differentiation identified as the most significant pathway. Molecular docking demonstrated favorable binding affinities of valencene with TNF (−7.3 kcal/mol), ERK (−6.9 kcal/mol), and PPARG (−7.3 kcal/mol).

Conclusion: The findings suggest that valencene may exert potential anti-rheumatic effects through multi-target modulation of inflammatory pathways and osteoclast differentiation.

Keywords: Rheumatoid arthritis, Valencene, Network pharmacology, Molecular docking.

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HERBAL INTERVENTIONS IN GOUTY ARTHRITIS: A SYSTEMATIC REVIEW OF INFLAMMATORY PATHWAYS

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ABSTRACT

***Background*:** Urate crystal deposition and high uric acid buildup in joints are the causes of gouty arthritis (GA), a chronic inflammatory disease. Complex processes including oxidative imbalance, inflammatory signaling, and metabolic dysregulation are involved in its development. The majority of current medicines concentrate on managing symptoms rather than preventing disease, which has led to an increase in interest in medicinal plants as multi-targeted and conventional therapeutic substitutes.

***Objective*:** The purpose of this review is to examine the data about medicinal plants that may have anti-gout properties, with a focus on their functions in regulating uric acid, controlling inflammation, reducing oxidative stress, and molecular pathways.

***Methods*:** Using keywords linked to gout, herbal remedies, oxidative stress, inflammatory pathways, and xanthine oxidase, pertinent research articles were methodically gathered from reputable scientific databases. Reviews were conducted of publications published from March 2012 to December 2025. Using predetermined criteria, eligible in vitro and in vivo research were chosen, and data on medicinal plants, bioactive substances, experimental methods, biomarkers tested, and study results were critically analyzed.

***Results*:** According to an analysis of 15 relevant studies, several medicinal plants and their active ingredients successfully decreased serum uric acid levels and the inflammation linked to gout. Suppression of xanthine oxidase activity, control of pro-inflammatory cytokines and immune cells, reduction of oxidative stress, and modification of important transport and communication pathways involved in urate homeostasis were all identified as contributing factors to the reported anti-gout benefits.

***Conclusion*:** By altering uric acid levels, inflammation and oxidative stress via a variety of molecular mechanisms, medicinal plants show great promise in the treatment of gout. To verify biomarker involvement, therapeutic efficacy and long-term safety of plant-based anti-gout medicines, however, thorough experimental validation and clinical studies are necessary.

Keywords: medicinal herbs, xanthine oxidase, inflammatory cells, gouty arthritis

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MECHANISTIC ANALYSIS OF *Gentiana scabra* IN INFLAMMATORY BOWEL DISEASE USING NETWORK PHARMACOLOGY

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ABSTRACT

Background: Inflammatory Bowel Disease (IBD) is a chronic, relapsing inflammatory disorder of the gastrointestinal tract characterized by immune dysregulation, oxidative stress, and mucosal damage. Despite available conventional therapies, long-term treatment is often limited by adverse effects and variable efficacy, necessitating safer and multi-targeted therapeutic alternatives.

Objective: This study aimed to investigate the mechanistic role of *Gentiana scabra* in the management of IBD using a network pharmacology approach integrated with molecular docking analysis.

***Methods*:** Bioactive compounds of *Gentiana scabra* were screened based on pharmacokinetic parameters, including oral bioavailability and drug-likeness. Potential compound targets were predicted and intersected with IBD-related genes retrieved from public databases to identify common therapeutic targets. A compound–target–disease network was constructed to illustrate multi-component interactions. Protein–protein interaction (PPI) network analysis was performed to identify hub genes. Gene Ontology (GO) and Kyoto Encyclopaedia of Genes and Genomes (KEGG) enrichment analyses were conducted to explore associated biological processes and signaling pathways. Molecular docking analysis was performed to validate binding affinities between major phytoconstituents and core target proteins.

Results: Key targets were mainly involved in inflammatory response, cytokine-mediated signaling, apoptosis regulation, and oxidative stress pathways. Significant pathways included TNF, NF-κB, MAPK, and PI3K-Akt signalling pathways. Molecular docking demonstrated strong binding affinities between major compounds and core targets.

Conclusion: *Gentiana scabra* exerts anti-inflammatory and immunomodulatory effects through multi-target and multi-pathway mechanisms, supporting its therapeutic potential in IBD management and providing a basis for future experimental validation.

Keywords: Inflammatory Bowel Disease (IBD), Network Pharmacology, Molecular Docking, Signaling Pathways.

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LIPID NANOCARRIER MEDIATED DERMAL DELIVERY OF FLAVONOIDS FOR THE MANAGEMENT OF ATOPIC DERMATITIS

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ABSTRACT

Background: Atopic dermatitis is a chronic relapsing inflammatory skin disorder characterized by epidermal barrier dysfunction, elevated IgE levels and overexpression of Th2-mediated cytokines such as IL-4, IL-13 and TNF-α. Conventional topical corticosteroids and calcineurin inhibitors are associated with adverse effects upon prolonged use. Flavonoids exhibit significant anti-inflammatory, antioxidant and immunomodulatory activities, but their topical application is limited by poor solubility, low stability and inadequate skin retention. Lipid nanocarriers, including solid lipid nanoparticles and nanostructured lipid carriers, provide enhanced dermal penetration, controlled drug release and improved interaction with stratum corneum lipids.

Objective: The present review aims to summarize the potential of lipid nanocarrier systems for targeted dermal delivery of flavonoids in atopic dermatitis with emphasis on formulation approaches, penetration mechanisms and therapeutic outcomes.

Methods: A systematic literature analysis was conducted using PubMed, Scopus and ScienceDirect databases focusing on flavonoid-loaded lipid nanocarriers, atopic dermatitis pathophysiology and topical nano delivery systems. Studies reporting physicochemical characterization, ex vivo permeation, in vivo anti-inflammatory efficacy and safety were critically evaluated.

Results: Lipid nanocarriers significantly improved flavonoid encapsulation efficiency, physicochemical stability and sustained release profiles. Enhanced skin hydration and occlusion facilitated deeper penetration and prolonged retention within the epidermis. Preclinical models demonstrated marked reduction in erythema, transepidermal water loss, mast cell infiltration and pro-inflammatory cytokine expression compared to conventional formulations. Nanostructured lipid carriers exhibited superior drug loading capacity and release modulation relative to solid lipid nanoparticles.

Conclusion: Lipid nanocarrier-mediated delivery of flavonoids offers a promising, steroid-sparing therapeutic strategy for atopic dermatitis by improving dermal bioavailability, restoring skin barrier function and modulating inflammatory pathways. Further clinical investigations are required to establish long-term safety and translational potential.

Keywords: Flavonoids, Lipid nanocarriers, Atopic dermatitis, Dermal drug delivery

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INTEGRATED PHYTOCHEMICAL AND PHARMACOLOGICAL EVALUATION OF *Solanum viarum* DUNAL AS A POTENTIAL ANTIDIABETIC THERAPEUTIC AGENT

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ABSTRACT

Background: Medicinal plants are widely used in traditional systems for the management of diabetes mellitus. *Solanum viarum* is known for various pharmacological properties, but its antidiabetic potential has not been well explored scientifically.

Objective: The present study aimed to evaluate the phytochemical composition and antidiabetic activity of the ethanolic extract of *Solanum viarum* using an experimental rat model.

Methods: Pharmacognostic and phytochemical evaluations of the plant were carried out using standard procedures. LC–MS and FTIR analyses were performed to identify major phytoconstituents. Molecular docking studies were conducted using selected phytocompounds against diabetes-related targets (PPAR α/γ, GLP-1, GPR40 and SUR-1). Acute oral toxicity was assessed according to OECD guidelines. Antidiabetic activity was evaluated in streptozotocin-induced diabetic rats. Biochemical parameters were analyzed, and histopathological examination of pancreatic tissue was performed.

Results and Conclusion: Phytochemical screening revealed the presence of alkaloids, flavonoids, glycosides, tannins, phenolic compounds, proteins, and triterpenoids. The extract showed no significant toxic effects. Treatment with the plant extract produced a significant reduction in blood glucose levels in diabetic rats. Improvement in pancreatic islet cells and connective tissue architecture was also observed, indicating protective and regenerative effects on pancreatic tissue. The findings suggest that the ethanolic extract of *Solanum viarum* possesses notable antihyperglycemic activity and may help in the management of diabetes mellitus. The antidiabetic effect is likely due to the presence of bioactive phytoconstituents. Further studies are required to isolate and characterize the specific compounds responsible for this activity.

Keywords: Diabetes mellitus, *Solanum viarum*, Phytochemical screening, Molecular docking, Pancreatic histopathology.

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TARGETED DRUG DELIVERY USING NANOPARTICLES IN CANCER THERAPY

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ABSTRACT

***Background*:** Cancer remains a major global health challenge due to high mortality rates and the limitations of conventional treatments such as chemotherapy and radiotherapy. These therapies often lack specificity, leading to damage of healthy tissues, systemic toxicity, and development of multidrug resistance. The poor target-to-non-target distribution of anticancer drugs reduces therapeutic effectiveness. Nanoparticle-based drug delivery systems have emerged as a promising approach to improve drug targeting, enhance therapeutic efficiency, and minimize adverse effects.

***Objective*:** This review aims to evaluate the role of nanoparticle-based targeted drug delivery systems in cancer therapy, focusing on their mechanisms of action, advantages over conventional therapies, and potential in overcoming drug resistance while minimizing toxicity.

***Methods*:** A detailed review of recent scientific literature was carried out to analyze different types of nanoparticles (1–100 nm), including polymeric, lipid-based, metallic, and hybrid nanoparticles. Their targeting strategies such as passive targeting through the enhanced permeability and retention (EPR) effect, active targeting via ligand-receptor interaction, organelle-specific targeting, and tumor microenvironment based approaches were examined. Studies related to drug loading capacity, surface modification, stability enhancement, biocompatibility, and preclinical and clinical evaluation were also reviewed.

***Results and Conclusion*:** Nanoparticles improved drug stability, enhanced tumor accumulation, and reduced systemic toxicity compared to conventional formulations. These systems also showed potential in overcoming multidrug resistance by modulating drug efflux transporters and targeting hypoxic tumor regions. Hybrid nanoparticles further improved therapeutic outcomes by combining multiple functional properties. However, challenges such as limited clinical translation, large-scale production issues, and long-term safety concerns remain. Nanoparticle-mediated targeted drug delivery represents a significant advancement in cancer therapy. While promising preclinical and early clinical results have been reported, further research is essential to address safety and regulatory challenges to achieve successful clinical implementation.

Keywords: Targeted drug delivery, Nanoparticles, Cancer therapy, Chemotherapy, Multidrug resistance.

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FROM BOTANICAL EXTRACTS TO IMMUNE POTENTIATION: A REVIEW ON DIFFERENT PHYTOADJUVANTS FROM PLANTS OF NORTH EAST INDIA

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ABSTRACT

***Background*:** Antimicrobial resistance (AMR) has emerged as a critical global health crisis driven by the misuse and overuse of antibiotics in human, veterinary, and agricultural practices. The rapid rise of multidrug-resistant (MDR) pathogens, particularly Gram-negative bacteria with impermeable outer membranes and overexpressed efflux pumps, has severely limited the efficacy of existing antibiotics. Biofilm formation, quorum sensing, enzymatic drug inactivation, and target modification further accelerate resistance development, reducing treatment success and increasing healthcare burden.

***Objective*:** This review aims to study the potential of different plant-derived secondary metabolites (phytoadjuvants) from different plants of the North Eastern Region as antibiotic adjuvants. This study mainly focuses on highlighting their mechanisms in reversing resistance, and assess their synergistic application with conventional antibiotics to combat drug-resistant infections.

***Methods*:** A systematic review of peer-reviewed literature was conducted using databases including PubMed and Google Scholar. Studies published between 2020 and 2024 focusing on phytochemicals such as alkaloids, terpenoids, coumarins, and phenolics were analyzed. Emphasis was placed on mechanisms including efflux pump inhibition, antibiofilm activity, quorum sensing disruption, and nanomaterial-based delivery systems.

***Results and Conclusion*:** Phytoadjuvants demonstrated significant synergistic effects with antibiotics by reducing minimum inhibitory concentrations (MICs) and restoring drug susceptibility against resistant pathogens such as Staphylococcus aureus and Pseudomonas aeruginosa. These compounds target both extracellular barriers (biofilms, extracellular matrix) and intracellular resistance mechanisms (efflux systems, DNA replication, protein synthesis). Phyto-derived nanomaterials further enhance bioavailability and penetration across biofilm barriers. Phytoadjuvants offer a promising, multi-targeted strategy to restore antibiotic efficacy and combat AMR. However, further *in vivo* validation, toxicity evaluation, and clinical trials are required to facilitate their integration into modern antimicrobial therapy.

Keywords: Phytoadjuvants, Antimicrobial resistance (AMR), Multidrug-resistant bacteria (MDR), Efflux pump inhibitors, Biofilm inhibition, Antibiotic synergism.

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MOLECULAR MECHANISTIC EVALUATION OF *Piper chaba* IN BREAST CANCER USING NETWORK PHARMACOLOGY AND MOLECULAR DOCKING APPROACHES

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ABSTRACT

***Background*:** Breast cancer is a complex disease involving multiple proteins and signalling pathways, especially those related to estrogen signalling and apoptosis. *Piper chaba* is a medicinal plant traditionally used for various health benefits, but its molecular role in breast cancer is not well explored.

***Objective*:** To investigate the molecular mechanism of *Piper chaba* against breast cancer using network pharmacology and molecular docking approaches.

***Methods*:** Active compounds of *Piper chaba* were identified and their target proteins were predicted. These targets were overlapped with breast cancer–related genes to obtain common targets. Protein–protein interaction analysis was performed to identify key hub proteins. Gene Ontology and KEGG pathway enrichment analyses were used to understand biological functions and pathways. Molecular docking was carried out between selected phytochemicals and key proteins and compared with the standard drug tamoxifen.

Results and Conclusion: Five key proteins namely ESR1, CASP3, MDM2, PARP1, and BCL2 were identified. Enrichment analysis showed involvement in estrogen response, apoptosis, and DNA damage–related processes. Important pathways included p53 signaling, apoptosis, and endocrine resistance. Docking results showed strong binding of β-sitosterol with all key proteins, comparable to tamoxifen. This study suggests that *Piper chaba* may act against breast cancer through multi-target regulation of estrogen signaling and apoptosis pathways, supporting its potential as a natural therapeutic candidate.

Keywords: *Piper chaba*, Breast cancer, Network pharmacology, Molecular docking.

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FORMULATION AND EVALUATION OF *Curcuma caesia*–LOADED TRANSDERMAL PATCHES FOR ANTIMICROBIAL ACTIVITY AGAINST *Escherichia coli*

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ABSTRACT

***Background*:** Transdermal drug delivery systems provide a controlled and sustained release of bioactive compounds, enhancing therapeutic efficacy and patient compliance. *Curcuma caesia*, a medicinal plant rich in bioactive phytoconstituents, is known for its significant antimicrobial properties and has potential for incorporation into advanced drug delivery systems.

***Objective*:** To formulate and evaluate *Curcuma caesia*-loaded transdermal patches and assess their physicochemical properties, drug release behaviour, and antimicrobial activity against *Escherichia coli*.

***Methods*:** Transdermal patches were prepared using suitable polymeric matrices. Pre-formulation studies were conducted using Fourier Transform Infrared (FTIR) spectroscopy to determine drug–excipient compatibility. Analytical method development involved determination of maximum absorption wavelength (λ_{max}) and preparation of a calibration curve in phosphate buffer (pH 7.4). The formulated patches were evaluated for thickness, folding endurance, drug content uniformity, and percentage moisture content. Antimicrobial activity was assessed against *Escherichia coli* using the agar well diffusion method. *In vitro* skin permeation studies were carried out using a Franz diffusion cell to evaluate drug release.

Results and Conclusion: FTIR studies confirmed the compatibility between *Curcuma caesia* and excipients, indicating formulation stability. The analytical method showed good linearity. The patches exhibited uniform thickness, adequate mechanical strength, and consistent drug content. Moisture content was within acceptable limits. The antimicrobial study demonstrated significant antibacterial activity against *Escherichia coli*, with concentration-dependent zones of inhibition. *In vitro* permeation studies revealed sustained and controlled drug release. The developed *Curcuma caesia*-loaded transdermal patches demonstrated satisfactory physicochemical properties, effective antimicrobial activity against *Escherichia coli*, and controlled drug release, indicating their potential as a promising transdermal therapeutic system for antimicrobial applications.

Keywords: *Curcuma caesia*, Transdermal patch, Antimicrobial activity, *Escherichia coli*.

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EVALUATION OF BIOACTIVE POTENTIAL OF RED AND BLACK ANT EXTRACTS AS NATURAL ANTIMICROBIAL AND ANTIOXIDANT AGENTS

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ABSTRACT

***Background*:** The increasing emergence of antimicrobial resistance and oxidative stress–related disorders has intensified the search for novel bioactive compounds from unconventional natural sources. Edible and medicinal insects have recently gained scientific attention due to their rich content of bioactive metabolites with potential therapeutic applications.

***Objective*:** The present study aims to evaluate the antimicrobial and antioxidant potential of extracts obtained from red ant (*Oecophylla smaragdina*) and black ant (*Polyrhachis dives*), traditionally consumed in several indigenous communities for their perceived health benefits.

***Methods*:** Ant samples were collected from the campus of School of Pharmaceutical Sciences, GCU, Tezpur, from their natural habitats and subjected to extraction using a biphasic solvent system of hexane and water in 5: 1 ratio. The antimicrobial activity of the extracts was assessed against *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis* and *Klebsiella pneumonia*, using agar disk diffusion method and minimum inhibitory concentration (MIC) was determined, ciprofloxacin as the standard. Antioxidant potential was evaluated employing established methods including DPPH and Hydrogen Peroxide scavenging assay. Preliminary phytochemical screening was performed to identify major classes of bioactive constituents such as alkaloids, phenols, flavonoids, peptides and organic acids that may contribute to the observed biological activities.

***Results and Conclusion*:** The IC 50 value for the antimicrobial activity of *Oecophylla smaragdina* extract was found to be 17.32 mg/ml whereas the antimicrobial activity of *Polyrhachis dives* extract was found to exhibit IC 50 value of 66.78 mg/ml against *E. coli*. The IC 50 value of the *Oecophylla smaragdina* extract against *S. aureus* was found to be 44.69 mg/ml. The antioxidant value was found to be 28.72 mg/ml for *Oecophylla smaragdina* extract and 41.46 mg/ml for *Polyrhachis dives* extract. The study had shown comparable antimicrobial activity of both the ant extracts against *E. Coli*. The red ant extract was found to be active against *S. aureus* also. The antioxidant potential of the *Oecophylla smaragdina* extract was found to be better than the *Polyrhachis dives* extract. Further study may lead to the identification of more potent compounds with diverse biological activity.

Keywords: Antimicrobial, Antioxidant, *Oecophylla smaragdina*, *Polyrhachis dives*.

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IN SILICO DRUG REPURPOSING OF BEZAFIBRATE AS A POTENTIAL THERAPEUTIC AGENT FOR INFLAMMATORY BOWEL DISEASE

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ABSTRACT

***Background*:** Inflammatory bowel disease (IBD), comprising Crohn's disease and ulcerative colitis, represents a chronic inflammatory disorder of the gastrointestinal tract, attributable to intricate interactions among genetic predispositions, environmental influences, and immune dysregulation. Conventional treatments exhibit limitations, prompting exploration of drug repurposing strategies. Bezafibrate, a PPAR agonist traditionally employed for dyslipidemia management, demonstrates prospective anti-inflammatory properties, necessitating computational evaluation for its applicability in IBD.

***Objective*:** To investigate the anti- colitis potential of bezafibrate using *in silico* approaches, encompassing network pharmacology, molecular docking, toxicological profiles and elucidating signaling pathways.

***Methods*:** The molecular structure of bezafibrate was obtained from PubChem. Potential targets were forecasted using Swiss Target Prediction and cross-referenced with IBD-associated genes sourced from Gene Cards, OMIM, and DisGeNET. Protein-protein interaction networks were constructed via STRING, with topological analyses conducted in Cytoscape. Gene Ontology and Kyoto Encyclopedia of Genes and Genomes enrichment were executed using ShinyGO. Molecular docking was performed with PyRx against principal hub proteins (e.g., PPARG, mTOR). Toxicity assessments were undertaken via ProTox- II.

Results and Conclusion: Bezafibrate was essentially inactive across organ- specific endpoints, according to toxicological study (0.59- 0.81). PPARG, mTor, and PIK3CA are important regulators of inflammation and intestinal homeostasis in IBD, according to network pharmacology, which found 46 common targets. The docking scores varied from -6.5 to -9.7 kcal/mol, with the highest binding to CSF1R (-9.7) and PIK3CA (-9.1), which is similar to the binding of sulfasalazine to TNF- α (-9.2). Computational findings substantiate bezafibrate's multifaceted therapeutic potential in IBD via modulation of mTOR and PPAR pathways. These insights advocate for subsequent empirical validation to facilitate its repurposing as a cost-effective intervention for IBD management.

Keywords: Inflammatory bowel disease (IBD), Bezafibrate, Network pharmacology, Molecular docking.

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INTEGRATIVE SYSTEMS PHARMACOLOGY ANALYSIS TO DECIPHER THE MULTI-COMPONENT, MULTI-TARGET MECHANISMS OF *MEDICAGO SATIVA* IN THE TREATMENT OF RHEUMATOID ARTHRITIS

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ABSTRACT

Background: Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disorder characterized by synovial hyperplasia, persistent inflammation, and resistance to apoptosis. Dysregulation of proliferative and survival signaling pathways such as PI3K-Akt and mTOR plays a critical role in disease progression.

Objective: The present study aimed to investigate the molecular interaction of selected phytoconstituents with key RA-associated proteins and to identify the most plausible signaling pathway underlying their mechanism of action using molecular docking analysis.

Methods: Molecular docking was performed against five major RA-related targets: AKT1, MTOR, CCND1, BCL2, and ESR1. Binding affinities were analyzed and compared with the standard ligand Methotrexate. Functional roles of the proteins were correlated with Gene Ontology (biological process, molecular function, and cellular component) and KEGG pathway associations relevant to RA.

Results: Among all targets, MTOR exhibited the most consistent high-affinity interactions, particularly with phenylchromone (-8.7 kcal/mol), followed by ESR1 (-8.9 kcal/mol), BCL2 (-7.6 kcal/mol), and CCND1 (-7.3 kcal/mol). AKT1 also showed moderate binding interactions. Functional annotation indicates that AKT1 and MTOR are central components of the PI3K-Akt and mTOR signaling pathways regulating immune cell activation and synoviocyte proliferation. CCND1 promotes G1/S cell cycle progression contributing to synovial hyperplasia, while BCL2 inhibits apoptosis, enabling survival of inflammatory fibroblast-like synoviocytes. ESR1 is associated with estrogen-mediated immune modulation.

Conclusion: The findings suggest that the phytoconstituents may exert anti-rheumatoid activity primarily through modulation of the PI3K/AKT/MTOR signaling axis, thereby regulating abnormal cell proliferation and apoptosis resistance in RA. These multi-target interactions highlight MTOR as a potential molecular hub and warrant further experimental validation.

Keywords: Rheumatoid arthritis, PI3K-Akt pathway, mTOR signaling, Molecular docking

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A STUDY ON THE MECHANISM OF ACTION OF *TERMINALIA CHEBULA* IN THE TREATMENT OF GOUT USING NETWORK PHARMACOLOGY AND MOLECULAR DOCKING APPROACH

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ABSTRACT

Background: Gout is a chronic metabolic inflammatory disease caused by the accumulation of monosodium urate crystals in joints, resulting in intense inflammation, oxidative stress and activation of pro-inflammatory mediators. Although allopurinol is widely prescribed for gout management, its prolonged use is associated with adverse effects. Terminalia chebula, a traditional medicinal plant, is reported to possess significant anti-inflammatory and antioxidant activities, however, its underlying molecular mechanism in gout treatment has not been fully elucidated.

Objective: The present study aimed to investigate the therapeutic mechanism of Terminalia chebula phytoconstituents in gout using an integrated network pharmacology and molecular docking approach and to compare their binding potential with the standard drug allopurinol.

Methods: Potential targets of Terminalia chebula phytoconstituents and gout-associated genes were identified and intersected to obtain common targets. Protein–protein interaction network construction and functional enrichment analyses were performed using STRING and DAVID databases to identify key targets and pathways. Molecular docking was conducted against major hub proteins, including IL6 (4CNI), STAT3 (6NJS), JUN (5T01), PTGS2 (5KIR) and BCL2L1 (7LH7), using AutoDock tools. Selected phytoconstituents, namely maslinic acid, corosolic acid, arjunolic acid, daucosterol and ascorbic acid, were evaluated and compared with allopurinol.

Results: Network analysis identified key inflammatory targets such as PTGS2, STAT3, MAPK14, IL6, VEGFA, and JUN. Enrichment analysis revealed significant involvement in inflammatory mediator regulation, VEGF signalling, Rap1 signalling and AGE-RAGE signalling pathways. Molecular docking results demonstrated that daucosterol exhibited the strongest binding affinity with PTGS2 (–9.6 kcal/mol), followed by maslinic acid (–9.5 kcal/mol), which were markedly higher than that of allopurinol (–7.0 kcal/mol). Corosolic acid and arjunolic acid also showed favourable binding interactions with multiple targets.

Conclusion: These findings suggest that Terminalia chebula exerts anti-gout effects through multi-target regulation of key inflammatory proteins and signalling pathways. The superior binding affinity of daucosterol and maslinic acid indicates their potential as promising natural candidates for the development of safer and effective anti-gout therapeutics.

Keywords: Terminalia chebula, Gout, Network pharmacology, Molecular docking, daucosterol, Maslinic acid, Allopurinol.

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AN INVESTIGATION INTO THE MECHANISM OF ACTION OF *Elaeis guineensis* IN WOUND HEALING USING MOLECULAR DOCKING AND NETWORK PHARMACOLOGY

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ABSTRACT

Background: *Elaeis guineensis* is traditionally used for wound management, yet its molecular basis of action remains poorly defined. This study evaluates the interaction of five major phytocompounds—β-sitosterol, stigmasterol, tocopherol, tocotrienol and linolenic acid—with wound-healing–related proteins using molecular docking and network pharmacology.

Objective: To determine the mechanism of action of *Elaeis guineensis* bioactives by integrating docking results with enrichment analysis and comparing their performance with the standard drug silver sulfadiazine.

Methods: Docking was performed against TNF, CCND1, AKT1, HIF1A and ESR1. Identified targets were subjected to DAVID-based enrichment to determine associated biological processes, molecular functions, cellular components and KEGG pathways relevant to wound healing.

Results and Conclusion: Stigmasterol and β-sitosterol demonstrated the strongest binding across multiple proteins, with binding energies comparable to or higher than silver sulfadiazine. High-affinity interactions were observed with TNF (−9.8, −9.3 kcal/mol), AKT1 (−8.6, −8.1 kcal/mol) and ESR1 (−8.7, −8.5 kcal/mol), suggesting potent multi-target activity. Enrichment results indicated involvement of the target proteins in inflammatory regulation, angiogenesis, cell-cycle control and tissue regeneration. Cellular component annotations mapped them to nuclear, cytosolic and membrane-associated regions, while molecular function analysis highlighted kinase regulation, cytokine signaling and transcriptional control. KEGG pathways identified included PI3K-AKT, TNF, HIF-1, estrogen signaling and cell-cycle pathways key regulators of inflammation, proliferation and re-epithelialization. The combined findings suggest that *Elaeis guineensis* phytocompounds promote wound healing by modulating TNF-mediated inflammation, enhancing angiogenesis via HIF1A, supporting fibroblast proliferation through CCND1, and stimulating re-epithelialization via AKT1 and ESR1. This multi-target activity supports the therapeutic potential of *Elaeis guineensis* in wound repair.

Keywords: *Elaeis guineensis*, Molecular docking, Network pharmacology, Phytocompounds.

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TRADITIONAL MEDICINAL PLANTS OF NORTH-EAST INDIA USED IN THE TREATMENT OF CHRONIC LIVER DISEASE AND CENTRAL NERVOUS SYSTEM DISORDERS

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ABSTRACT

Background: North-East India is a hub of various plants with medicinal properties which have not been properly documented yet. It has been noted that various north east Indian communities use medicinal plants for treatment of diseases. It is imperative that systematic and comprehensive documentation of these medicinal plants be undertaken to ensure the preservation and continuity of traditional knowledge for future generations.

Objectives: This study is performed to highlight, document and preserve the knowledge of various traditional medicinal plants used by various communities across North East India.

Methods: The data has been collected by a systemic review on published literature and analysis of local reports.

Result and Conclusion*:* It was observed that the North East Indian region has a wide variety of traditional medicinal plants which have been used by the various communities and whose knowledge has been passed down through generations. This study emphasizes the necessity of accurate documentation and scientific evaluation in order to preserve cultural legacy, encourage sustainable use, and assist future therapeutic developments. It also illustrates the significant traditional knowledge of medicinal plants in North-East India.

Keywords: Medicinal Plants, Chronic Liver Disease, Central Nervous System Disorders, North East India

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EVALUATION OF ANTI-OXIDANT, ANTI-OBESITY AND ANTIDIABETIC ACTIVITY OF *Pogostemon benghalensis* LOUR. WITH SPECIAL EMPHASIS ON GLUCOSE UPTAKE ASSAY AGAINST THE 3T3L1 CELL LINE

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ABSTRACT

***Background*:** Medicinal plants or herbs act as reservoirs of therapeutic agents and are subsequently used as medicaments for various ailments. *Pogostemon benghalensis* Lour. (*P. benghalensis* Lour.) is one such plant of the Lamiaceae family. However, scientific exploration of its hypoglycaemic activity is minimal.

***Objective*:** The objective of this study was to evaluate the phytochemical content, antioxidant capabilities, anti-obesity and antidiabetic activities of various leaf extracts of *P. benghalensis*.

***Methods*:** The preliminary phytochemical screening was conducted on the different extracts of *P. benghalensis.* The in vitro antioxidant activity was evaluated by using various antioxidant assays. The preliminary antidiabetic efficacy was assessed by α-amylase and α-glucosidase inhibition assay. The extracts that worked best were then tested against orlistat to check their pancreatic lipase inhibition and against 3T3-L1 cell lines to check their glucose uptake abilities.

***Results and Conclusion*:** Phytoconstituents, including alkaloids, flavonoids, terpenoids, phenolics, etc., are particularly abundant in the hydroalcoholic and methanolic extracts. The antioxidant activity of these extracts was comparable to that of the standard drug. The hydroalcoholic and methanolic extracts showed significant inhibition with IC_{50} values of 89.93 ± 0.099 and 96.21 ± 0.224 µg/ml, respectively, as compared to standard acarbose 68.38± 0.123 µg/ml for α-amylase. Whereas, the same extracts exhibit significant inhibition with IC_{50} values of 99.27 ± 0.726 µg/ml and 116.11 ± 0.296 µg/ml, respectively, as compared to standard acarbose 77.41±0.559 µg/ml against α-glucosidase. Both extracts showed dose-dependent pancreatic lipase inhibition compared to orlistat, and they also exhibit significant glucose uptake in 3T3-L1 cells at a concentration of 31.25 µg/ml. The leaf extracts of *P. benghalensis*, especially the hydroalcoholic and methanolic extracts, exhibit considerable hypoglycaemic, antioxidant, and anti-obesity properties, indicating their potential as natural therapeutic agents for diabetes control. Additional in vivo and clinical investigations are necessary.

Keywords: *Pogostemon benghalensis* Lour., anti-diabetic, anti-obesity, 3T3-L1 cell line

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HYDROXYMETHYL PHTHALIMIDE-1,3,5-TRIAZINE DERIVATIVES AS ANTI-ALZHEIMER'S AGENT: *IN -SILICO* APPROACH

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ABSTRACT

***Background*:** Alzheimer disease (AD) is a progressive neurodegenerative disorder characterised by dementia or irreversible memory loss. Hydrolysis of acetylcholine in synaptic region is executed by acetylcholinesterase (AChE) and butyrylcholinesterase (BuChE) which lead to lower the acetylcholine concentration that cause dementia. Increase the concentration of acetylcholine by inhibiting its degradation might be one strategy for prevent dementia.

Objective: The objective is to *in-silico* design hydroxymethyl phthalimide-substituted 1,3,5-triazine as a potential anti-AD agent.

***Methods*:** Library of 720 molecules was prepared and processed through rigorous screening to determination of drug-like properties, ADME and toxicity studies by using BIOVIA Discovery Studio Client 2023 and best screened molecules were proceeded for molecular docking studies.

Results and Conclusion: After analysing the binding energy and ligand receptors interaction, it has been found that, compounds A21, A27, B6, B43, C21, C22, E18, E21, E42, and F21 were showing highest binding affinity with the targeted acetylcholinesterase and butyrylcholinesterase having crucial interaction with TRP84, PHE330, TRP279, SER286, TYR121, TYR334. Among them, compounds A21, C21 and E43 shows highest binding of -258.323, -251.56, -419.044, -342.145 and -357.681, -217.237 Kcal/mol with AChE (PDB:1EVE) and BuChE (PDB: 4TPK) respectively as compared to standard drug donepezil with binding energy -208.498 and -187.035 Kcal/mol. From the above *in-silico* study it can be concluded that compound A21, C21 and E43 possess drug like properties that might be used against AD.

Keywords: Alzheimer's disease, Acetylcholinesterase, Butyrylcholinesterase, In-silico studies.

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EXPLORING THE MECHANISM OF PORTULACA OLERACEA IN SYSTEMIC LUPUS ERYTHEMATOSUS THROUGH MOLECULAR DOCKING AND NETWORK PHARMACOLOGY

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ABSTRACT

***Background*:** Systemic lupus erythematosus (SLE) is a complex autoimmune disease characterized by dysregulated apoptosis, chronic inflammation, and cytokine-driven immune imbalance. *Portulaca oleracea* has been traditionally recognized for its medicinal properties, but its molecular mechanism in SLE remains unclear.

***Objective*:** To investigate the mechanism of action of *Portulaca oleracea* bioactive compounds using molecular docking and network pharmacology, and to compare their activity with the standard drug prednisolone.

***Methods*:** Docking was performed against five hub proteins relevant to SLE pathogenesis: BCL2, c-JUN, MMP9, PTGS2 (COX-2), and STAT3. Identified targets were subjected to enrichment analysis (DAVID) to determine associated biological processes, molecular functions, cellular components, and KEGG pathways.

***Results and Conclusion*:** Daucosterol exhibited the strongest binding affinity across all proteins (–7.6 to –8.5 kcal/mol), surpassing prednisolone in several cases, particularly against STAT3 and MMP9. Functional enrichment linked these proteins to apoptosis regulation, transcriptional control of inflammatory genes, extracellular matrix degradation, prostaglandin biosynthesis, and cytokine signalling. Cellular component and molecular function annotations mapped them to the nucleus, cytoplasm, mitochondria, and extracellular matrix. KEGG pathway mapping identified JAK-STAT signalling, MAPK/AP-1 signalling, arachidonic acid metabolism, and apoptosis as key pathways converging on immune dysregulation and tissue damage in SLE. The findings suggest that *Portulaca oleracea* exerts therapeutic potential through multi-target modulation of STAT3, c-JUN, and COX-2, thereby attenuating cytokine signalling, inflammatory gene transcription, and prostaglandin-mediated inflammation. This integrative approach provides mechanistic insight into its immunomodulatory effects and supports its potential as a complementary therapeutic strategy in SLE.

Keywords: *Portulaca oleracea*, Molecular docking, Network pharmacology, Systemic lupus erythematosus.

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THERMORESPONSIVE NANOCARRIERS AS PRECISION TOPICAL SYSTEM FOR THE REPIGMENTATION IN VITILIGO

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ABSTRACT

***Background*:** Vitiligo is a chronic autoimmune depigmenting disorder characterized by melanocyte destruction driven by interferon-γ–mediated cytotoxic $CD8^+$ T cell responses and oxidative stress. Although targeted therapies such as Ruxolitinib demonstrate clinical benefit, therapeutic outcomes remain limited by inadequate epidermal penetration, suboptimal follicular targeting, systemic exposure, and high relapse rates. Thermoresponsive nanocarriers offer a stimuli-responsive strategy for localized, controlled drug delivery within inflamed cutaneous tissue.

***Objective*:** To critically evaluate the mechanistic rationale, design principles, and therapeutic potential of thermoresponsive nanocarriers as precision drug delivery platforms for sustained immunomodulation and melanocyte protection in vitiligo.

***Methods*:** This review includes recent advances in thermosensitive polymeric nanoparticles, nanogels, liposomes, and nanostructured lipid carriers engineered using lower critical solution temperature (LCST)-based polymers such as PNIPAM and poloxamer matrices. Emphasis is placed on nanocarrier skin interface dynamics, temperature-triggered phase transition behavior, follicular targeting efficiency, and controlled release kinetics. Molecular outcomes were analyzed in the context of modulation of the Janus kinase–Signal Transducer and Activator of Transcription proteins (JAK–STAT) pathway, CXCL10 suppression, oxidative stress attenuation, and melanocyte survival signaling.

***Results and Conclusion*:** Thermoresponsive nanocarriers demonstrate enhanced epidermal retention, sustained release of immunomodulators, and improved targeting of inflammatory niches compared with conventional topical formulations. Preclinical evidence suggests effective suppression of IFN-γ–induced signaling, reduced T cell infiltration, and restoration of redox balance in melanocytes. Moreover, co-delivery approaches integrating JAK inhibitors with antioxidant or melanogenic agents may enable synergistic immunoregulation and repigmentation. Despite promising translational potential, challenges, including polymer biocompatibility, immunotoxicity, manufacturing scalability, and stability under variable skin temperatures, require further investigation. Collectively, thermoresponsive nanotechnology represents a rational, precision-oriented strategy for durable, localized therapy in the management of vitiligo.

Keywords: Vitiligo, Thermoresponsive nanocarriers, Stimuli-responsive drug delivery, JAK–STAT pathway

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FORMULATION AND CHARACTERIZATION OF BERBERINE LOADED LYOTROPIC LIQUID CRYSTAL (LLC)

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ABSTRACT

***Background*:** Berberine is a bright yellow, bitter alkaloid extracted from plants like Goldenseal, Barberry and Oregon grape. It offers several metabolic benefits. It acts as blood sugar lowering agent at the same time it also has potential against Alzheimer and Inflammation. The poor solubility and low bioavailability limits the therapeutic use of Berberine. Thus encapsulation of Berberine in carrier particle like LLC stands as most acceptable form of delivery system.

***Objective*:** To formulate Berberine loaded lyotropic liquid crystal, thus enhancing the bioavailability and solubility of Berberine.

***Methodology*:** In this study, we developed lyotropic liquid crystalline particle (LLC) to enhance the solubility and bioavailability of Berberine. The LLC are thermodynamically stable mesophases that exist between solid and liquid states. And it was prepared by top-down method using Poloxomer, Glyceryl Monostearate (GMS) and Monoolein. The particles were characterized based on size, in-vitro release, entrapment efficiency, PDI and Zeta potential.

***Results and conclusion*:** The "top-down" homogenization method using GMS, Monoolein and Poloxomer successfully produced stable, sub-micron particles. The inclusion of Poloxomer acted as an effective steric stabilizer, preventing particle aggregation. The release profile exhibited a biphasic pattern with initial moderate "burst release" followed by a sustained, controlled release over several hours. This sustained release is attributed to the tortuous internal water channels of the liquid crystalline matrix, which slow down the diffusion of the drug.

Keywords: Bioavailability, Lyotropic Liquid Crystal, Solubility.

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TRANSFORMING FEATHER WASTE INTO KERATIN NANOCARRIERS FOR NOSE-TO-BRAIN DRUG DELIVERY IN DEMENTIA WITH LEWY BODIES

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ABSTRACT

***Background*:** The poultry industry generates large amounts of duck feathers annually, especially with the rise of fast food consumption. Only a small fraction of these feathers are used for packing, embellishment, or forage, while the majority are discarded. Being biodegradable, feathers require extensive dumping areas, and their landfill leachate can release heavy metals, organic and inorganic compounds, and pathogens, ultimately contaminating groundwater. Improper disposal thus poses significant environmental challenges.

***Objective*:** Duck feathers are rich in keratin, a structural protein also found in hair, hooves, horns, and wool. Keratin is unique due to its high cysteine content (7–13%), which imparts stability and functionality. Over the past decades, keratin-based biomaterials have attracted attention for their biocompatibility and intrinsic biological properties. Extraction methods include oxidation, reduction, steam explosion, alkaline hydrolysis, and microbial degradation. Among these, alkaline hydrolysis provides higher yields of crude keratin, making it a preferred approach.

Methods: In this study, crude keratin obtained from duck feathers is processed into nanoparticles to serve as drug carriers. These keratin nanoparticles are loaded with curcumin, a natural polyphenol with neuroprotective properties. Administration is planned via the intranasal route, which offers a promising strategy to bypass the blood–brain barrier and minimize systemic side effects. Importantly, human olfactory axons have diameters ranging from 0.1–0.7 µm, suggesting that only nanoscale entities can effectively traverse this pathway. Keratin nanoparticles, therefore, not only meet the dimensional requirements but also provide a biodegradable, eco-friendly solution for feather recycling.

***Results and Conclusion**:* This approach integrates waste management with therapeutic innovation, offering a sustainable method to repurpose poultry byproducts while advancing nose-to-brain drug delivery for conditions such as Lewy body disease.

Keywords: Keratin, Curcumin, Nanoparticle, Nose-to-brain delivery, Blood brain barrier, Duck feather.

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IN-SILICO STUDY OF NOVEL PYRAZOLINE-1,3,5-TRIAZINE DERIVATIVE AS POTENTIAL ANTI-CANCER AGENTS

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ABSTRACT

***Background*:** Cancer is a leading cause of death worldwide, characterized by uncontrolled cell proliferation. Breast cancer is the most prevalent malignancy among women and a major contributor to cancer-related mortality. It is the term used to characterize the disease which occurs when the regular growth of breast cells is disrupted. Due to the significant adverse effects that chemotherapy drugs typically have on host cells, there is a hunt for safe and viable substitutes. Therefore, the search for new, safer, and more potent anticancer drugs is urgently needed. Heterocyclic scaffolds with a variety of biological functions, including anticancer potential, like pyrazoline specially 4,5-dihydropyrazole-1- carbothioamide (DPC) and 1,3,5-triazine, have drawn a lot of attention.

***Objective*:** To design and evaluate 4,5-dihydropyrazole-1- carbothioamide-substituted 1,3,5-triazine derivatives using in-silico methods including ADME–toxicity screening and molecular docking against MMP-2 and MMP-9.

Methods: A library of pyrazoline-1,3,5-triazine derivatives was designed using ChemDraw Ultra 12.0.2. Pharmacokinetic and toxicity profiles were predicted using SwissADME and TOPKAT (Discovery Studio 3.0). Molecular docking was performed using the CDOCKER protocol against MMP-2 (PDB ID: 7XJO) and MMP-9 (PDB ID: 1GKC).

Results and Conclusion: Ten compounds (PA1, PA2, PA64, PA90, PB5, PB46, PB90, PC1, PC2, and PC64) demonstrated superior binding affinities against PDB ID: 7XJO and PDB ID: 1GKC compared to the reference inhibitor Batimastat. The docking scores ranged from −94.45 to −114.00 and −175.60 to −224.76, respectively, whereas Batimastat showed scores of −92.58 and −174.29 against the respective targets. The ligands formed multiple conventional hydrogen bonds with key active-site residues including Leu188, Ala189, Glu402, Tyr423, and His401 indicating promising inhibitory potential against MMPs. The *in-silico* results suggest that the designed pyrazoline-1,3,5-triazine derivatives exhibit promising anti-breast cancer potential and may serve as lead candidates for further experimental investigation.

Keywords: Breast cancer, 4,5-dihydropyrazole-1- carbothioamide, 1,3,5- triazine, DPC, MMP.

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EVALUATION OF PHYTOCHEMICAL PROFILE, ANTI-OXIDANT & ANTI-INFLAMMATORY POTENTIAL OF PROFILE OF *Oldenlandria corymbosa* L: A TRADITIONAL PLANT OF ASSAM

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ABSTRACT

Background: *Oldenlandia corymbosa* L. is a traditionally valued medicinal herb widely used in indigenous systems of medicine for the management of diabetes, inflammation and other chronic disorders. However, comprehensive evaluation of its phytochemical, elemental and biological properties remains limited.

***Objective*:** The present study aimed to investigate the phytochemical profile, elemental composition, antioxidant activity and in vitro anti-inflammatory potential of *Oldenlandia corymbosa* L.

***Methods*:** The polyphenolic extract of the plant was subjected to qualitative phytochemical screening and estimation of total phenolic (TPC) and total flavonoid content (TFC). HPLC fingerprinting was performed to identify major phenolic markers. Elemental analysis was carried out using Atomic Absorption Spectroscopy (AAS) to determine essential and trace elements. Antioxidant activity was evaluated using DPPH, ABTS radical scavenging and reducing power assays. Anti-inflammatory activity was assessed by inhibition of protein denaturation using the egg albumin method.

***Results*:** Phytochemical screening revealed the presence of phenols, flavonoids, alkaloids, saponins, tannins and glycosides. The TPC and TFC were found to be 19.11 mg GAE/g and 1.85 mg QE/g respectively of ethanolic extract. HPLC analysis confirmed the presence of gallic acid and quercetin as major bioactive constituents. AAS analysis detected essential elements such as iron (Fe) of 5.06 mg/L with low relative standard deviation (0.80%), potassium (K) of 441.40 mg/L with low relative standard deviation (2.40%), magnesium (Mg) of 647.90 mg/L with low relative standard deviation (0.30 %) and manganese (Mn) of -17.43 mg/L with low relative standard deviation (0.70 %), which are known to play important roles in metabolic and antioxidant processes. Lead (Pb) was also analysed and found within permissible safety limits of -5.97mg/L with low relative standard deviation (0.20 %). The extract exhibited significant, concentration-dependent antioxidant activity in DPPH, ABTS and reducing power assays. Furthermore, notable inhibition of protein denaturation was observed, indicating promising anti-inflammatory potential.

***Conclusion*:** The study demonstrates that *Oldenlandia corymbosa* L possesses substantial anti-oxidant and anti-inflammatory activities supported by its rich phenolic content and beneficial elemental composition, thereby scientifically validating its traditional therapeutic use.

Keywords: *Oldenlandia corymbosa L*, Anti-oxidant activity, Anti-inflammatory activity, HPLC, AAS

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PHARMACOGNOSTIC EVALUATION AND *IN-VITRO* ANTIMICROBIAL, ANTIOXIDANT AND ANTHELMINTIC STUDIES OF *NEPENTHES KHASIANA* HOOK.F. LEAF EXTRACT

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ABSTRACT

***Background*:** *Nepenthes khasiana* Hook.f. is an endangered carnivorous plant primarily found in the state of Meghalaya, India. It has been traditionally used for different medicinal purposes, however, scientific validation of its pharmacognostic and biological activity remains limited.

***Objective*:** The present study aims to carry out pharmacognostic evaluation, phytochemical screening, total phenolic content, total flavonoid content and in-vitro antimicrobial, antioxidant and anthelmintic activity.

***Methods*:** The fresh leaves of *N. khasiana* were collected, authenticated and extracted. Pharmacognostic investigations including macroscopic, microscopic and physicochemical analyses were performed along with preliminary phytochemical screening to identify the presence of bioactive constituents. The total phenolic and flavonoid contents were determined using Folin–Ciocalteu and aluminium chloride methods. *In-vitro* antimicrobial activity was carried out against selected microbial cultures. Free radical scavenging assays were used to assess the antioxidant activity. Using tapeworms, the anthelmintic activity was evaluated by recording paralysis and death time.

***Results and Conclusion*:** The pharmacognostic analysis showed specific morphological and microscopic features. Physicochemical parameters were found to be within the standard range indicating good quality and stability, supporting further bioactivity assessment. Phytochemical screening revealed the presence of secondary metabolites in the leaf extract. The total phenolic and flavonoid content were found to be 48.9mg GAE/g and 49.1mg QE/g extract. The ethanolic leaf extract exhibited significant antimicrobial activity against the tested microorganisms and also showed moderate antioxidant activity with dose-dependent free radical scavenging effects. The extract also demonstrated anthelmintic activity inducing paralysis and death of tapeworms in a concentration-dependent manner, though with a slower onset compared to standard Albendazole. The findings of the present study provide scientific evidence supporting the traditional use of *N. khasiana* and highlight its potential as a natural source of antimicrobial, antioxidant and anthelmintic agents. Further studies are required to isolate and characterize the active compounds responsible for these activities.

Keywords: *Nepenthes khasiana*, antimicrobial, anthelmintic, antioxidant.

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MEDICINAL PLANTS IN HERBAL COUGH SYRUPS: A REVIEW OF POLYHERBAL MARKETED FORMULATIONS AND CLINICAL EVIDENCE

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ABSTRACT

***Background*:** Cough is a vital protective reflex mechanism that clears the respiratory tract of irritants, excess mucus and foreign particles. However, persistent cough negatively impacts sleep, productivity, and quality of life. Conventional medicines are often associated with adverse effects such as sedation and dependency, creating a demand for safer herbal alternatives. Polyherbal formulations combine multiple medicinal plants to produce synergistic and multi-target therapeutic effects.

***Objective*:** To review medicinal plants commonly utilized in herbal cough syrups and evaluate the clinical and preclinical evidence of selected marketed polyherbal formulations.

***Methods*:** A literature-based review was conducted focusing on traditional medicinal plants and three marketed polyherbal cough syrups: Honitus, Linkus, and Zeal SF Cough Syrup. Data from published clinical trials and preclinical toxicity and antitussive studies were analyzed.

***Results*:** Key medicinal plants such as *Ocimum sanctum*, *Glycyrrhiza glabra*, *Adhatoda vasica*, *Zingiber officinale*, *Piper longum*, and *Solanum xanthocarpum* are some of the widely used plants for cough. Clinical studies show significant reductions in cough frequency, throat irritation, and sleep disturbances with efficacy comparable to conventional cough syrups, but with fewer side effects. Preclinical studies confirm safety and significant antitussive activity.

***Conclusion*:** Polyherbal cough syrups provide effective, multi-target, and safer alternatives for cough management. Scientific validation and regulatory strengthening will further enhance their global acceptance and therapeutic potential.

Keywords: Polyherbal formulations, Herbal cough syrup, Medicinal plants, Antitussive activity, Clinical evidence.

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POLYPHENOL-BASED NANOTHERAPEUTICS TARGETING THE GUT-BRAIN AXIS IN ALZHEIMER'S DISEASE

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ABSTRACT

Background: Alzheimer's disease is characterized by amyloid-β aggregation, tau hyperphosphorylation, oxidative stress, mitochondrial dysfunction, and chronic neuroinflammation. Emerging evidence highlights gut microbiota dysbiosis as a significant contributor to disease progression through increased intestinal permeability, systemic endotoxemia, altered short-chain fatty acid production, and disruption of the blood-brain barrier. These alterations exacerbate neuroinflammatory cascades and neuronal injury via the gut-brain axis.

Objective: To integrate mechanistic insights linking microbiota dysbiosis, neuroinflammation, and amyloid pathology, and to evaluate the therapeutic potential of polyphenol-based nanocarrier systems as a multi-targeted strategy for disease modification in Alzheimer's disease.

Methods: A comprehensive literature review was conducted using the electronic databases such as PubMed, Google Scholar and Scopus focusing on (i) the role of gut microbiota in Alzheimer's pathogenesis, (ii) neuroprotective mechanisms of natural polyphenols-including curcumin, resveratrol, quercetin, and epigallocatechin gallate, and (iii) advances in nanocarrier-based delivery systems such as lipid nanoparticles, polymeric nanoparticles, and nano emulsions to enhance bioavailability and brain targeting. The Keywords included: Gut-Brain Axis in Alzheimer's, Polyphenols, Nano formulations, Nanotechnology, Microbiota Dysbiosis, Brain-targeted drug delivery and Alzheimer's Disease.

Results and Conclusions*:* Natural polyphenols demonstrate multi-targeted neuroprotective effects by activating antioxidant pathways (e.g., Nrf2), inhibiting NF-κB-mediated inflammation, reducing amyloidogenesis, and restoring mitochondrial homeostasis. Additionally, polyphenols modulate gut microbial composition and promote beneficial metabolites that indirectly influence central nervous system function. However, poor solubility, rapid metabolism, and limited brain penetration restrict their therapeutic efficacy. Nanocarrier systems improve stability, controlled release, intestinal permeability, systemic bioavailability, and blood-brain barrier transport, thereby potentially optimizing polyphenol-microbiota interactions and enhancing neuroprotection.

Polyphenol-based nanotherapeutics represent a systems-level therapeutic strategy that simultaneously targets intestinal and neural pathways. By integrating microbiota modulation with enhanced brain delivery, nano-enabled phytotherapy offers promising disease-modifying potential in Alzheimer's disease.

Keywords: Alzheimer's Disease, Gut-Brain Axis, Polyphenol, Nanotherapeutics, Microbiota Dysbiosis

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FORMULATION AND *IN-VITRO* EVALUATION OF BILAYERED TABLETS OF METFORMIN HYDROCHLORIDE AND ATORVASTATIN CALCIUM

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ABSTRACT

***Background*:** Diabetes mellitus is commonly associated with dyslipidemia, requiring long-term combination therapy for effective glycemic and lipid control. A bilayer tablet delivering both sustained and immediate drug release may enhance therapeutic efficacy and patient compliance.

***Objectives*:** To formulate and evaluate a bilayer tablet containing sustained-release Metformin Hydrochloride and immediate-release Atorvastatin Calcium for improved management of type 2 diabetes mellitus with associated dyslipidemia.

***Methods*:** The sustained-release layer of Metformin Hydrochloride was prepared using hydrophilic polymers such as sodium carboxymethyl cellulose and HPMC K4M to prolong drug release. The immediate-release layer of Atorvastatin Calcium was formulated to ensure rapid onset of action, with HPMC 15 cps as a channeling agent. Bilayer tablets were prepared by wet granulation followed by compression. Pre-compression parameters (angle of repose, bulk density, tapped density) were evaluated for flow properties. Post-compression tests included hardness, friability, thickness, weight variation, and drug content uniformity. Drug–excipient compatibility was assessed using FT-IR spectroscopy. In vitro drug release and stability studies (as per ICH guidelines) were performed, and release kinetics were analyzed.

***Results and Conclusion*:** Granules showed good flow properties, and all tablets complied with pharmacopeial limits. FT-IR confirmed drug–excipient compatibility. The optimized formulation exhibited an initial burst release followed by sustained release of Metformin up to 8 hours, achieving 92.53% cumulative release. Stability studies showed no significant changes in physical parameters or drug release. Release kinetics followed non-Fickian diffusion with near zero-order behavior. The developed bilayer tablet demonstrated satisfactory physicochemical properties, controlled drug release, and stability, indicating its potential as an effective combination therapy for diabetes mellitus with dyslipidemia.

Keywords: Bilayer tablet, Metformin Hydrochloride, Atorvastatin Calcium, Type 2 diabetes mellitus

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EVALUATION OF *IN-VITRO* ANTIOXIDANT AND *IN- VIVO* ANTIHYPERLIPIDEMIC ACTIVITY FROM THE ROOT EXTRACT OF STEMONA TUBEROSA LOUR.

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ABSTRACT

***Background and Objective*:** Cardiovascular diseases continue to be one of the leading causes of death worldwide, largely driven by modifiable factors such as high lipid levels and oxidative stress–related atherosclerosis. In this study, we investigated the in vitro antioxidant activity and in vivo antihyperlipidemic effects of the hydroalcoholic root extract of *Stemona tuberosa* Lour. to assess its potential as a comprehensive and natural therapeutic option.

***Methodology*:** The roots of *S. tuberosa* were extracted using a hydroalcoholic solvent mixture of ethanol and water (70:30, v/v). The phytochemical composition of the extract was analyzed through HPTLC and LC-MS techniques. Its antioxidant potential was assessed using DPPH radical scavenging, hydrogen peroxide scavenging, and reducing power assays, along with the estimation of total phenolic and flavonoid contents. The antihyperlipidemic activity of the extract was investigated in Wistar rats employing both high-cholesterol diet and Triton X-100–induced hyperlipidemia models, with doses of 200 mg/kg and 400 mg/kg administered orally.

Results and Conclusion: LC-MS and HPTLC analyses confirmed the presence of several important bioactive compounds, including flavonoids, phenolic acids, and alkaloids. The extract demonstrated strong in vitro antioxidant activity, showing excellent DPPH and hydrogen peroxide scavenging ability along with notable reducing power. In both *in-vivo* hyperlipidemic models, treatment with the extract produced encouraging outcomes by significantly lowering atherogenic lipid parameters—such as serum triglycerides, total cholesterol, and LDL-C while simultaneously increasing cardioprotective HDL-C levels in a dose-dependent manner. The hydroalcoholic root extract of *S. tuberosa* shows strong antioxidant activity along with notable lipid-lowering effects. These results suggest that the extract holds promise as a potential therapeutic candidate for the management of dyslipidemia and the reduction of oxidative stress.

Keywords: Hyperlipidemia, Oxidative Stress, Triton X-100 & Translational Research

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MOLECULAR CHARACTERIZATION OF B-LACTAMASE CO-PRODUCTION IN MDR *E. COLI* ISOLATED FROM WASTEWATER EFFLUENTS OF DIBRUGARH, ASSAM

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ABSTRACT

Background: The rapid emergence of antimicrobial resistance (AMR) has become a major global public health concern. Wastewater systems serve as important reservoirs of antimocrobial residues and pharmaceutical compounds, originating from anthropogenic activities. Such environments promote the selection and dissemination of antimicrobial-resistant bacteria (ARB) and antimicrobial resistance genes (ARGs). *Escherichia coli*, a common indicator organism in wastewater, is also a clinically significant pathogen responsible for several infections in humans. This study aimed to investigate the prevalence of multidrug-resistant (MDR) Escherichia coli in wastewater and to determine the distribution of extended-spectrum β-lactamase (ESBL) and AmpC β-lactamase resistance genes.

Materials and Methods: Wastewater samples were collected aseptically from multiple locations across Dibrugarh district, Assam, and processed within six hours of collection. Bacterial isolation was performed using MacConkey agar and Eosin Methylene Blue (EMB) agar, followed by identification using standard microbiological and biochemical methods. Antibiotic susceptibility testing was conducted using the Kirby–Bauer disk diffusion method against multiple antibiotic classes according to CLSI 2022 guidelines. Phenotypic detection of ESBL and AmpC production was performed, and polymerase chain reaction (PCR) was employed to detect the associated resistance genes.

Results: A total of 126 *E. coli* isolates were recovered from wastewater samples. Among which 56 isolates exhibited multidrug resistance and 14 isolates co-harboured ESBL and AmpC β-lactamase genes. Molecular analysis identified blaCTX-M as the most prevalent ESBL genotype among the isolates.

Conclusion: The findings highlight wastewater as a potential environmental reservoir of MDR *E. coli*. The detection of ESBL-AmpC co-producing isolates indicates a possible transmission pathway between environmental and clinical settings, contributing to the escalating challenge of antimicrobial resistance and posing significant risks to public health.

Keywords: Antibiotics; Antimicrobial resistance bacteria; Environment; Genotypes; Wastewater

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QUANTITATIVE PROFILING AND IN-VITRO EVALUATION OF ANTIOXIDANT AND ANTI-INFLAMMATORY BIOACTIVE PEPTIDES FROM SHIDAL, A TRADITIONAL FERMENTED FISH OF NORTHEAST INDIA

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ABSTRACT

***Background*:** Chronic inflammation and oxidative stress are major contributors to metabolic disorders and degenerative diseases. Fermented foods are increasingly recognised as natural sources of bioactive peptides and antioxidant compounds that modulate inflammatory pathways. Shidal, a traditional salt-free fermented fish product from Northeast India, undergoes prolonged anaerobic fermentation that promotes proteolysis and the generation of small bioactive peptide fractions enriched in hydrophobic and essential amino acids. These peptides may contribute to both antioxidant defence and the control of inflammation.

***Objective*:** To isolate peptide-rich crude extracts from Shidal and evaluate their in-vitro antioxidant and anti-inflammatory potential along with quantitative biochemical profiling.

***Methods*:** Shidal samples were subjected to sensory evaluation and proximate composition analysis (moisture, protein, fat, fibre and ash content). Peptide-rich crude extracts were prepared using solvent extraction, sonication-assisted recovery, and freeze drying. Quantitative peptide estimation was performed using the Bradford assay. Structural profiling was conducted using FTIR spectroscopy. Antioxidant activity was assessed using DPPH and ABTS radical scavenging assays. Anti-inflammatory potential was evaluated through in-vitro protein denaturation inhibition and membrane stabilisation assays. Statistical analysis was performed using one-way ANOVA.

***Results and Conclusion*:** Quantitative analysis revealed high protein content and measurable peptide concentration in crude extracts. Antioxidant assays demonstrated strong radical scavenging activity, indicating effective electron donation capacity. Anti-inflammatory evaluation showed significant inhibition of protein denaturation and stabilisation of erythrocyte membranes in comparison with standard controls. Spectral profiling confirmed the presence of peptide functional groups and diverse bioactive fractions.

Keywords: Shidal, fermented fish, bioactive peptides, antioxidant activity, anti-inflammatory activity, quantitative profiling, ethnopharmacology

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DEVELOPMENT AND FABRICATION OF NOVEL NANO-VESICLES FOR ENHANCED TRANSDERMAL DELIVERY OF BIOACTIVES

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ABSTRACT

***Background*:** Transdermal drug delivery systems (TDDS) have emerged as a promising route due to their ability to provide controlled release, improved patient compliance, avoidance of first-pass metabolism, and reduced systemic side effects. However, the effectiveness of transdermal delivery is significantly limited by the unique barrier properties of the skin. Bioactives, despite their pharmacological efficacy, suffers from poor aqueous solubility, low stability, rapid degradation, and inadequate skin permeation, which limit their clinical translation.

***Objective*:** This research traces development of nanovesicles to overcome the limitations associated with conventional transdermal delivery of bioactives and attain enhanced therapeutic efficacy.

***Methods*:** Modified solvent-diffusion ultrasonication method was employed to obtain nano-vesicles formulation that was characterized for vesicle shape and size, polydispersity index (PDI), zeta potential, entrapment and loading efficiency, in-vitro release and skin permeation.

***Results*:** The optimized nano-vesicles exhibited a spherical shape with particle size of less than 300 nm with a narrow polydispersity index (PDI), high entrapment and drug loading efficiency. The morphological studies exhibit the distinctive spherical shape of the nanoformulation. The in-vitro drug release from nano-vesicles demonstrated sustained release of bioactives at skin pH, indicative of a pH-responsive release pattern and good physiological stability. The prepared nanogel exhibited optimal physicochemical and rheological properties for topical application. The optimized nanogel exhibited significantly higher ($P<0.05$) skin permeation profile compared to conventional gel preparation.

***Conclusions*:** Our findings suggested that the developed novel nano-vesicles represents a rational and advanced approach to overcome the limitations associated with conventional transdermal delivery of bioactives and serves as a promising novel transdermal delivery carrier.

Keywords: Transdermal delivery, nano-vesicles, Bioactives, Sustained release

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DEVELOPMENT, OPTIMIZATION AND EVALUATION OF MICROSPHERE BASED CREAM OF MARIGOLD (*Tagetes erecta* L.) LEAF EXTRACT FOR WOUND HEALING

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ABSTRACT

***Background*:** Wound healing is a complex biological process involving cellular activity, cytokine signalling, inflammatory mediators, collagen deposition, including multifactorial immune. Proper blood circulation, immune function, moist contaminant-free environment are required for effective healing. Conventional topical formulations show poor drug retention and drug release, leading to delayed healing. Microparticulate drug delivery systems offer controlled drug release, improved stability, and enhanced site-specific action. Tagetes erecta L. (marigold), commonly grown as an ornamental plant, possesses antimicrobial and wound-healing efficacy.

***Objective*:** This study aims to evaluate a micro particulate cream loaded with T. erecta L. extract as a microsphere for potential topical wound-healing.

***Methods*:** *T. erecta* L. were collected, dried and processed to obtain extract for formulating microsphere containing cream. Drug–excipient compatibility using FTIR, morphological analysis, λ max determination using UV–Visible spectrophotometry, particle size analysis by optical microscopy, optimization, drug loading, swelling index, and drug release studies were carried out. The developed cream was evaluated for homogeneity, pH, spreadability, viscosity, and stability.

***Results*:** The prepared formulation reported average particle size of 1300 ± 5 µm, swelling index 88%, Drug release was 75.12%. The reported λ max of extract was observed at 265 nm. No D-E interaction was reported as per FTIR analysis, XRD analysis for crystallinity was determined.

***Conclusions*:** The developed formulation exhibited a promising drug delivery for wound healing. Further in vivo studies shall determine the therapeutic efficacy and safety for future clinical application.

Keywords: Microparticles, T. erecta, Cream, Antimicrobial, Optimization.

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MICROBIOME-MODULATING THERAPEUTICS: BRIDGING HOLISTIC INTERVENTIONS AND TRANSLATIONAL PHARMACOLOGY

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ABSTRACT

***Background*:** The human microbiome plays an important role in maintaining host metabolism, immunity, and overall health. Microbial imbalance promotes metabolic disorders, gastrointestinal disease, inflammatory condition and immune related illness. Modulation of gut microbial communities through holistic interventions such as dietary changes, probiotics, prebiotics and phytochemicals has emerged as a promising therapeutics strategy.

***Objective*:** To bridge these natural interventions with translational pharmacology, which may help to convert traditional or lifestyle-based therapies into scientifically validated and clinically effective treatments.

***Methods*:** A literature review was collected using scientific databases including PubMed, Google Scholar, and ScienceDirect to identify relevant articles and research studies published in recent years with keywords including "gut microbiome", "microbiome-modulating therapeutics", "probiotics", "prebiotics", "phytochemicals", and "translational pharmacology" were used for the search. The review focus on microbiome-modulating strategies, their mechanisms of action, therapeutic outcomes, and translation into clinical applications. Interventions analyzed included probiotic and prebiotic formulations, dietary modifications, plant-based bioactives, and engineered microbial therapeutics.

***Results*:** Microbiome-modulating therapies can restore microbial balance, enhance immune responses, and improve metabolic and gastrointestinal health. Holistic interventions act as natural modulators of microbial composition, while translational pharmacology supports their standardization and mechanistic validation. These approaches have shown potential in managing metabolic disorders, inflammatory diseases, and gut-related conditions. However, challenges such as inter-individual variability, dosage optimization, and regulatory validation remain key considerations for clinical translation.

***Conclusions*:** Therapeutics that modulate the microbiome play an important role in bridging holistic healthcare methods to current pharmaceutical research. Scientific validation and translational development of these therapies could lead to more specific, effective, and safe therapeutic solutions for microbiome-related disorders.

Keywords: Probiotics, Gut microbiome, Translational pharmacology.

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SMART NANOPARTICLE-ENABLED TRANSDERMAL PATCH FOR TARGETED OSTEOARTHRITIS THERAPY: A PROMISING ALTERNATIVE TO INTRA-ARTICULAR INJECTIONS

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ABSTRACT

***Background*:** Osteoarthritis (OA) is a progressive degenerative joint disorder characterized by cartilage degradation, subchondral bone remodeling, synovial inflammation, oxidative stress, and overexpression of pro-inflammatory mediators. Conventional therapies, including oral anti-inflammatory drugs and intra-articular injections, primarily provide symptomatic relief but fail to ensure sustained drug concentration at the affected site and are often associated with systemic side effects or procedural discomfort.

***Objective*:** The present review aims to highlight recent advancements in smart nanoparticle-enabled transdermal patches as a non-invasive and targeted alternative for osteoarthritis management.

***Methods*:** A comprehensive analysis of recent literature was performed focusing on polymeric nanoparticle-based transdermal systems. Emphasis was given to nanoparticle characteristics such as particle size, surface charge, and polymer composition, along with strategies including permeation enhancers, follicular targeting, and stimuli-responsive nano-systems to improve dermal penetration and site-specific retention.

***Results and Conclusions*:** Incorporation of polymeric nanoparticles into bioadhesive transdermal matrices enhances drug solubility, stability, and controlled release. Optimized nanocarriers facilitate improved permeation across the stratum corneum while maintaining localized drug concentration near inflamed joints. Controlled diffusion and polymer relaxation mechanisms contribute to sustained therapeutic action and reduced systemic toxicity. Smart nanoparticle-enabled transdermal patches represent a promising platform for targeted osteoarthritis therapy by improving drug bioavailability, patient compliance, and therapeutic precision. Further translational studies, large-scale manufacturing optimization, and long-term safety evaluations are essential for successful clinical implementation.

Keywords: Osteoarthritis, Transdermal drug delivery, Polymeric nanoparticles, Targeted therapy.

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CELL MEMBRANE-TARGETED THERAPEUTIC STRATEGIES TO PREVENT ISCHEMIA-REPERFUSION INJURY

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ABSTRACT

***Background*:** Ischemia-reperfusion injury (IRI) is a major pathological event occurring after restoration of blood flow following ischemia in organs such as the heart, brain, kidney, and liver. Cellular damage during reperfusion is largely associated with oxidative stress, inflammation, mitochondrial dysfunction, and disruption of cell membrane integrity. Recent advances in nanomedicine and biomimetic systems have highlighted cell membrane–targeted therapeutic approaches as promising strategies for reducing tissue injury and improving clinical outcomes.

***Objective*:** This review critically evaluates emerging cell membrane-targeted therapeutic strategies designed to prevent or attenuate ischemia-reperfusion injury, with emphasis on molecular mechanisms, biomimetic drug delivery systems, and antioxidant-based interventions.

***Methods*:** A literature-based critical analysis was conducted using recent peer-reviewed studies on membrane-targeted therapies, nanocarriers, antioxidant systems, and biomimetic approaches for IRI management. Key mechanistic pathways and therapeutic advances were compared and evaluated.

***Results and Conclusions*:** Evidence suggests that targeting the cell membrane and its associated signalling pathways significantly improves therapeutic efficacy in IRI. Biomimetic nanoparticle systems, such as platelet membrane-camouflaged carriers, enhance targeting efficiency and reduce immune clearance. Additionally, antioxidant-based interventions, membrane-stabilising compounds, and nanotechnology-driven drug delivery platforms demonstrate promising protective effects by reducing reactive oxygen species, inflammatory responses, and lipid peroxidation. However, challenges, including clinical translation, safety evaluation, and large-scale production, remain. Future research should focus on optimising targeted delivery, improving biocompatibility, and conducting well-designed clinical trials to validate these strategies.

Keywords: Ischemia-reperfusion injury, Cell membrane targeting, Biomimetic nanoparticles, Oxidative stress

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LOCALLY ADAPTED FLORA USED BY ETHNIC COMMUNITIES OF GOALPARA DISTRICT, ASSAM, WITH SPECIAL REFERENCE TO LIVER DISORDERS: AN ETHNOPHARMACOLOGICAL STUDY

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ABSTRACT

***Background*:** The use of plants for therapeutic purposes since the era of the Vedic has remained integral to traditional healthcare systems in India. Assam, Northeast India, is a part of the Indo-Burma biodiversity hotspot. This rich floristic repository provides a substantial resource for ethnomedicinal practices among indigenous Assamese communities. Traditional practitioners continue to rely on locally available plant species for the management of liver disorders.

***Objective*:** The study aimed to document plant and plant-based formulations used by traditional practitioners in the Goalpara district of Assam for liver diseases, and to analyse their ethnomedicinal significance.

***Methods*:** Ethnomedicinal data were collected from 43 traditional herbal practitioners through interviews and semi-structured questionnaires. The information was systematically analysed using standardized ethnobotanical indices.

***Results*:** A total of 89 medicinal plant species belonging to 30 families were identified as being employed to cure liver disorders. The highest use values were recorded for *Averrhoa carambola* L. *Azadirecta indica* A. Jussi. Leaves were the most commonly utilized plant part due to their accessibility and ease of harvesting. Among families, Fabaceae and Asteraceae exhibited the highest family use value, underscoring their dominance in local hepatoprotective practices. While highly cited plants were considered important, low-citation species may still possess significant medicinal potential, with underutilization possibly linked to scarcity or lack of practitioner awareness.

***Conclusions*:** The findings emphasize the importance of indigenous knowledge systems in hepatoprotection. Further pharmacological and phytochemical validation is warranted to confirm their efficacy and support drug discovery. The study also underscores the socio-economic relevance of preserving indigenous medicinal practices.

Keywords: Ethnomedicine, Herbal practitioners, Hepatoprotective plants, Traditional knowledge.

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IMMUNOPATHOGENESIS OF PSORIASIS: THE CENTRAL ROLE OF IL-23 /TH -17 AXIS

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ABSTRACT

***Background*:** Psoriasis is a chronic, immune-mediated inflammatory skin disorder characterized by keratinocyte hyperproliferation and systemic inflammation. Advances in immunology have identified the interleukin-23 (IL-23)/T helper 17 (Th17) axis as the central pathogenic pathway driving disease initiation and maintenance. Dysregulated crosstalk between innate and adaptive immune cells results in sustained production of proinflammatory cytokines, leading to epidermal hyperplasia and plaque formation.

***Objective*:** To summarize the immunopathogenesis of psoriasis with emphasis on the IL-23/Th17 axis, highlighting its cellular interactions, cytokine network, and therapeutic implications.

***Methods*:** A narrative review of current immunological literature was conducted, focusing on experimental studies, translational research, and clinical trials that elucidate the role of IL-23, Th17 cells, and related cytokines in psoriasis pathogenesis.

***Results and Conclusions*:** Psoriasis initiation involves activation of dendritic cells by environmental triggers in genetically predisposed individuals. Activated dendritic cells produce IL-23, a heterodimeric cytokine essential for the differentiation, expansion, and survival of Th17 cells. Th17 cells secrete key effector cytokines, including IL-17A, IL-17F, and IL-22, which act on keratinocytes to induce antimicrobial peptides, chemokines, and additional proinflammatory mediators. This establishes a self-amplifying inflammatory loop involving neutrophils, macrophages, and other immune cells. IL-22 contributes to epidermal hyperplasia, while IL-17 promotes sustained inflammation and barrier dysfunction. Clinical efficacy of biologic agents targeting IL-23 or IL-17 further validates the central role of this axis in disease pathogenesis. The IL-23/Th17 axis represents the pivotal immunological pathway in psoriasis, integrating innate and adaptive immune responses to drive chronic inflammation and keratinocyte proliferation. Understanding this pathway has revolutionized targeted therapy and continues to shape precision based management strategies for psoriasis.

Keywords: IL-23/Th17 Axis, Psoriasis Immunopathogenesis, Keratinocyte Hyperproliferation.

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INDIGENOUS KNOWLEDGE OF *Homalomena aromatica* SCHOTT. AND TS EMERGING PHARMACEUTICAL RELEVANCE

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ABSTRACT

***Background*:** *Homalomena aromatica* Schott (family Araceae) is an aromatic medicinal medicinal flora extensively found in the forests of Northeast India, especially in Assam and adjacent region. Indigenous communities have traditionally used this plant as part of their healthcare systems for managing a variety of illness. Ethnobotanical research indicates that the rhizomes and leaves are commonly utilized to treat skin infections, gastrointestinal disorders, respiratory problems, rheumatism, wounds, and jaundice. The growing interest in plant-based therapeutics prompted further scientific investigation into the phytochemistry and pharmacological properties of this species.

***Objective*:** This review aims to examine the traditional medicinal uses of *H. aromatica* among indigenous communities of Northeast India and evaluate its phytochemical composition and pharmacological potential in the context of modern pharmaceutical research.

***Methods*:** A comprehensive review of published literature was conducted using scientific databases including PubMed, Scopus, and Google Scholar. Ethnobotanical surveys, phytochemical analyses, and pharmacological studies related to *H. aromatica* were systematically collected and analyzed to understand its traditional applications and therapeutic properties.

***Results*:** The plant is widely employed in indigenous medicine for the treatment of inflammatory conditions, microbial infections, digestive disorders, and respiratory diseases. Phytochemical studies indicate that the essential oil of H. aromatica is rich in bioactive terpenoids, with linalool identified as the dominant constituent along with terpinen-4-ol, δ-cadinene, and α-cadinol. These compounds have been reported to exhibit antimicrobial, anti-inflammatory, analgesic, antifungal, antidepressant, and sedative activities, supporting many of its traditional therapeutic uses.

***Conclusions*:** The integration of indigenous ethnomedicinal knowledge with modern pharmacological research highlights the significant therapeutic potential of *H. aromatica*. Its diverse bioactive constituents and broad spectrum of biological activities suggest promising applications in pharmaceutical development. Further experimental and clinical studies are required to validate its efficacy and facilitate its translation into evidence-based medicinal products.

Keywords: Ethnomedicine, Essential oil, Pharmaceutical potential

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ZINC SULFADIAZINE-LOADED NANOSTRUCTURED LIPID CARRIERS (NLCs): DEVELOPMENT, CHARACTERIZATION AND SUSTAINED IN-VITRO RELEASE FOR ENHANCED BURN THERAPY

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ABSTRACT

***Background*:** Burn injuries are highly prone to microbial infection, excessive inflammation, and delayed wound healing. Conventional topical therapies often show limited penetration and require frequent application. Nanostructured lipid carriers (NLCs) offer improved drug stability, enhanced skin retention and controlled release.

***Objective*:** The present study aimed to develop and evaluate zinc sulfadiazine-loaded NLCs for improved topical burn therapy.

***Methods*:** Zinc sulfadiazine-loaded NLCs were prepared using the hot homogenization followed by ultrasonication method employing a blend of solid and liquid lipids with suitable surfactants. The optimized formulation was characterized for particle size, polydispersity index (PDI), entrapment efficiency, and drug loading. In-vitro drug release studies were performed using a dialysis membrane diffusion method in PBS pH 6.5.

***Results and Conclusions*:** The optimized NLC formulation exhibited a particle size of 142.74 nm, indicating nanoscale distribution suitable for dermal penetration. The PDI was 22.8% (0.228), demonstrating uniform particle distribution. High entrapment efficiency (95.4%) confirmed effective drug incorporation within the lipid matrix. In-vitro drug release studies demonstrated an initial rapid release phase followed by a gradual and sustained release pattern over time. The release profile indicated controlled and diffusion-mediated drug release, suggesting prolonged drug availability at the burn site. Zinc sulfadiazine-loaded NLCs demonstrated desirable nanoscale characteristics, high entrapment efficiency, and sustained in-vitro drug release. The developed formulation shows promising potential as an advanced topical delivery system for effective burn wound management and warrants further in-vivo evaluation.

Keywords: Zinc Sulfadiazine, Nanostructured Lipid Carriers, Burn Wound Therapy, Topical Drug Delivery, Sustained Drug Release, Wound Healing.

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ARTIFICIAL INTELLIGENCE IN PHARMACY: REVOLUTIONIZING DRUG DISCOVERY AND PATIENT CARE

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ABSTRACT

***Background*:** Artificial Intelligence (AI) is transforming pharmacy practice and healthcare management by enabling data-driven decision-making, automation, and predictive analytics. Its integration into pharmaceutical sciences enhances drug development, medication safety, and patient-centered care.

***Objective*:** The study aims to explore the role of Artificial Intelligence in revolutionizing pharmacy, highlight its major applications in healthcare management, and discuss challenges, ethical concerns, and future prospects.

***Methods*:** A structured analytical review of AI applications in pharmacy was undertaken, focusing on drug discovery and development, personalized medicine, smart dispensing systems, medication adherence monitoring, pharmacovigilance, inventory management, and telepharmacy services. Real-world implementations were examined to assess clinical and retail pharmacy impact.

***Results*:** AI accelerates drug candidate identification and optimizes pharmacokinetic predictions, reducing development time and cost. Robotic dispensing systems minimize prescription errors and improve workflow efficiency. AI-powered adherence applications enhance patient compliance and therapeutic outcomes. Predictive analytics strengthen supply chain management and adverse drug reaction monitoring. However, challenges such as data privacy issues, regulatory limitations, algorithmic bias, and high implementation costs remain significant barriers.

***Conclusions*:** Artificial Intelligence represents a transformative advancement in pharmacy and healthcare management by improving efficiency, safety, and accessibility. Responsible adoption supported by ethical standards and regulatory frameworks is essential for sustainable integration. Future advancements integrating AI with wearable technologies and telepharmacy platforms are expected to further enhance real-time monitoring and expand healthcare access.

Keywords: Artificial Intelligence, Healthcare Management, Personalized Medicine, Drug Discovery, Telepharmacy.

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NUTRITIONAL AND PHYTOCHEMICAL CHARACTERIZATION OF TRADITIONALLY FERMENTED GUNDRUK: A PROXIMATE ANALYSIS APPROACH

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ABSTRACT

***Background*:** Gundruk is a traditional fermented food commonly consumed in Nepal, Sikkim, Darjeeling, and other parts of the Himalayas. It is produced by natural lactic acid fermentation of leafy vegetables, which improves nutrient availability and enriches the food with beneficial probiotic microorganisms. Proximate analysis which includes protein, fats, fiber etc and phytochemical screening confirms the presence of bioactive compounds like alkaloids, phenolics &amp, flavonoids while wing to its antioxidant properties, Gundruk may help protect liver function and reduce oxidative stress, however its hepatoprotective potential requires further scientific evaluation.

***Objective*:** The present study aimed to evaluate the quantitative analysis, proximate profile and phytochemical characteristics of the traditionally fermented food Gundruk.

***Methods*:** The polyphenolic extract of the Gundruk was subjected to qualitative phytochemical screening and estimation of total phenolic (TPC) and total flavonoid content (TFC). The proximate composition including protein, fibre, moisture, fat, ash, and total Carbohydrate analysis will be performed according to AOAC, 2022.

***Results*:** Phytochemical screening results confirmed the presence of phenols, flavonoids, and alkaloids. Proximate analysis quantitatively determined the composition of fibre, moisture, fat, ash, and total carbohydrates in the Gundruk sample.

***Conclusions*:** The study demonstrates that Gundruk possesses substantial proximate analysis and phytochemical screening supported by its rich phenolic content and beneficial elemental composition, thereby scientifically validating its traditional therapeutic use.

Keywords: Gundruk, Proximate Analysis, Fermented food.

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EXPLORING THE THERAPEUTIC POTENTIAL OF *Spondias pinnata* (L.f.) Kurz LEAVES: PHYSICOCHEMICAL WITH ANTIOXIDANT AND ANTI-INFLAMMATORY EFFECTS

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ABSTRACT

***Background*:** *Spondias pinnata* (L.f.) Kurz, commonly known as Indian hog plum, is a deciduous tree widely distributed across tropical and subtropical regions of the Indian subcontinent and Southeast Asia. Traditionally used in indigenous medicine, its leaves contain flavonoids, phenolic acids, tannins, and triterpenoids, including gallic acid and quercetin. These bioactive constituents suggest promising potential, warranting further physicochemical and pharmacological evaluation to validate its therapeutic applications.

***Objective*:** To investigate the physicochemical characteristics and evaluate the antioxidant and anti-inflammatory potential of *Spondias pinnata* leaves in order to explore their therapeutic relevance through appropriate in-vitro experimental models.

***Methods*:** For the estimation of the antioxidant and anti-inflammatory potential of the leaf extract of *Spondias pinnata* (L.f.) Kurz, various invitro were conducted such as Radical scavenging assays and Reducing power assay for antioxidant and Egg-Albumin denaturation assay for anti-inflammatory.

***Results*:** *Spondias pinnata* exposure to various models produced pronounced effectiveness in nomarlizing the oxidative stress in Radical scavenging assays and Reducing power assay and have also the potential in minimizing the inflammation in Egg-Albumin denaturation assay. Overall the S. pinnata leaf extract markedly attenuated the antioxidant and anti-inflammatory parameters in in-vitro models.

***Conclusions*:** The findings demonstrate that the *Spondias pinnata* extracts helps in mitigating, the antioxidant and anti-inflammatory potential in in-vitro models. Further in-vivo studies are needed for the confirmation of its antioxidant, anti-inflammatory, in counteracting various condition associated with it.

Keywords: *Spondias pinnata*, antioxidant, anti-inflammatory.

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ADVERSE DRUG REACTION MONITORING IN PSYCHIATRIC INPATIENTS: A PHARMACOVIGILANCE STUDY AT ASSAM MEDICAL COLLEGE AND HOSPITAL (AMCH), DIBRUGARH

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ABSTRACT

***Background*:** Psychotropic medications are vital for managing psychiatric disorders but are commonly associated with adverse drug reactions (ADRs), especially in hospitalized patients on multiple drugs. Continuous monitoring and statistical evaluation of ADRs are essential for patient safety and rational pharmacotherapy in psychiatric settings.

***Objective*:** To determine the frequency, clinical pattern, and statistical association between the number of prescribed psychotropic medications and ADR development among psychiatric inpatients in the Department of Psychiatry using SPSS analysis.

***Methods*:** A prospective observational study was conducted in the psychiatry ward of AMC, Dibrugarh. Ten inpatients receiving psychotropic therapy were monitored for suspected ADRs using a structured form. Demographic data, diagnosis, medication details, and reaction profiles were systematically recorded. Data were analysed using SPSS version 26.0. Descriptive statistics were expressed as mean ± standard deviation and percentages. The Chi-square test assessed the association between number of medications and ADR occurrence, with statistical significance set at $p < 0.05$.

Results: The mean patient age was 38.4 ± 10.6 years, with male predominance (80%). ADRs occurred in 60% of patients. Sedation was most common (30%), followed by tremors and behavioural changes (20% each). Patients receiving three or more psychotropic drugs had higher ADR incidence (75%) compared to those receiving two or fewer (33%). A significant association was observed between higher medication exposure and ADR development ($\chi^2 = 4.12$, $p = 0.042$). Most ADRs were classified as probable or possible per WHO UMC criteria and were mild to moderate in severity.

***Conclusion*:** Increased psychotropic medication exposure is significantly associated with higher ADR risk in psychiatric inpatients. Strengthened pharmacovigilance and careful therapeutic monitoring are crucial to improve medication safety and clinical outcomes.

Keywords: Adverse drug reaction, Psychiatry, Pharmacovigilance, SPSS analysis

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FORMULATION, CHARACTERIZATION AND *IN VITRO* EVALUATION OF CHITOSAN–PVA CROSSLINKED HYDROGEL INCORPORATED WITH QUERCETIN-LOADED SILVER NANOPARTICLES SYNTHESIZED USING ALOE VERA EXTRACT FOR TOPICAL DELIVERY

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ABSTRACT

***Background*:** Topical drug delivery systems require biocompatible matrices capable of providing sustained drug release and improved physicochemical stability. Silver nanoparticles (AgNPs) possess unique physicochemical properties, while quercetin is a poorly water-soluble flavonoid with significant pharmacological potential. Green synthesis using Aloe vera extract provides an eco-friendly and biocompatible method for nanoparticle fabrication. Chitosan–PVA hydrogels are widely explored polymeric systems due to their biocompatibility, mechanical strength, and suitability for controlled topical delivery.

***Objective*:** To formulate and characterize a physically crosslinked chitosan–PVA hydrogel incorporated with quercetin-loaded silver nanoparticles (QCT-AgNPs) synthesized using Aloe vera extract, and to evaluate its *in vitro* performance for topical drug delivery.

***Methods*:** QCT-AgNPs were synthesized via green reduction using Aloe vera extract and characterized by UV–Visible spectroscopy, particle size, polydispersity index (PDI), and zeta potential. Optimized nanoparticles were incorporated into a chitosan–PVA hydrogel prepared by the freeze–thaw technique. The hydrogel was evaluated for physicochemical properties, entrapment efficiency, *in vitro* drug release, release kinetics modelling, morphological characteristics, and stability under different storage conditions.

Results: The synthesized QCT-AgNPs exhibited nanoscale particle size, acceptable PDI, and sufficient zeta potential, indicating good colloidal stability. High entrapment efficiency confirmed effective drug incorporation. The developed hydrogel demonstrated suitable physicochemical properties for topical application and sustained drug release over an extended period. Release kinetics suggested controlled diffusion behaviour. Optical microscopy revealed a uniform and homogeneous matrix without visible aggregation. Stability studies indicated improved physicochemical stability under refrigerated conditions compared to room temperature.

***Conclusion*:** The developed chitosan–PVA crosslinked hydrogel incorporating green-synthesized QCT-AgNPs demonstrated desirable physicochemical characteristics, sustained release behaviour, and acceptable stability, highlighting its potential as a promising topical drug delivery platform.

Keywords: Chitosan–PVA hydrogel, silver nanoparticles, Quercetin, Green synthesis.

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EVALUATION FOR *IN VITRO* ANTIOXIDANT PROPERTIES OF THE EXTRACT OF TWO TRADITIONALLY USED FRUITS AND FORMULATION OF THE STANDARDIZED EXTRACT LOADED GRANULES FOR ORAL ADMINISTRATION.

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ABSTRACT

***Background*:** Medicinal plants are widely used in traditional medicine due to their rich phytochemical constituents and therapeutic potential. *Dillenia indica* commonly known as Ou tenga in Assamese, contains polyphenols, flavonoids and triterpenoids. *Garcinia pedunculata*, Thekera in Assamese, indigenous fruit plant of Northeast India. Traditionally used for digestion, jaundice, and liver disorders. Rich in xanthones, flavonoids, organic acids, and polyphenols.

***Objective*:** The present study aimed to prepare hydroalcoholic extracts of the selected fruits and evaluate their phytochemical profile, antioxidant activity, and suitability for formulation into herbal granules.

***Method*:** Dried fruit materials were powdered and subjected to hydroalcoholic extraction to obtain concentrated extracts. Preliminary phytochemical profiling was carried out using Thin Layer Chromatography (TLC) and High Performance Thin Layer Chromatography (HPTLC) for fingerprint analysis. Quantitative estimations including Total Phenolic Content (TPC), Total Flavonoid Content (TFC) were performed using standard spectrophotometric *Methods*. The antioxidant activity of the extracts was evaluated using the DPPH free radical scavenging assay and Ferric Reducing Antioxidant Power(FRAP). The combined extract was further formulated into herbal granules using the wet granulation method with suitable pharmaceutical excipients.

***Result*:** The extracts showed the presence of several phytoconstituents as confirmed by TLC and HPTLC profiling. Quantitative analysis showed the presence of good amounts of phenolics, flavonoids, and tannins. The hydroalcoholic extracts exhibited significant antioxidant activity in the DPPH and FRAP assay. The granules were formulated combining both extract with suitable pharmaceutical excipients

***Conclusion*:** The study demonstrates that hydroalcoholic extracts of the selected fruits possess significant phytochemical content and antioxidant potential. The successful formulation of herbal granules indicates their potential application in the development of effective herbal pharmaceutical products.

Keywords: *Dillenia indica*, *Garcina pedunculata*, DPPH, Granules

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PHYTOCHEMICAL PROFILING, ANTIOXIDANT ASSESSMENT AND ANTIMICROBIAL INVESTIGATION OF *Curcuma caesia* ROXB. LOADED POLYMERIC MICROSPHERES

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ABSTRACT

***Background*:** *Curcuma caesia* Roxb., popularly known as Assam Black Turmeric, is an important medicinal rhizome traditionally used in Northeast India for treating infections, inflammation, and wounds. Despite its therapeutic relevance, its practical application is restricted due to poor aqueous solubility and limited stability of active constituents. Development of a suitable drug delivery system may enhance its biological effectiveness.

***Objective*:** The present investigation aimed to evaluate the phytochemical profile, antioxidant capacity, and antimicrobial potential of ethanolic extract of Assam Black Turmeric rhizomes and to formulate extract-loaded sodium alginate microspheres for improved antimicrobial performance.

***Methods*:** Dried rhizomes were extracted using ethanol in a Soxhlet apparatus. Preliminary phytochemical screening was performed by standard qualitative assays. Total phenolic and flavonoid contents were quantified spectrophotometrically. Antioxidant activity was determined using the DPPH free radical scavenging method. Microspheres were prepared by ionotropic gelation using sodium alginate and calcium chloride. The prepared formulation was characterized for particle size, percentage yield, drug loading, entrapment efficiency, surface morphology, and *in vitro* release behavior. Antimicrobial activity was assessed against *Staphylococcus aureus* and *Escherichia coli* using the agar well diffusion technique. Statistical evaluation was carried out using one-way ANOVA.

***Results*:** Phytochemical analysis confirmed the presence of flavonoids, phenolics, tannins, alkaloids, and terpenoids. The extract demonstrated notable antioxidant activity with concentration-dependent radical scavenging effect. Optimized microspheres exhibited high entrapment efficiency and spherical morphology with sustained release pattern. The microsphere formulation produced significantly larger zones of inhibition compared to the crude extract ($p < 0.05$).

***Conclusion*:** Encapsulation of Assam Black Turmeric extract into sodium alginate microspheres enhanced its stability and antimicrobial efficacy. The developed formulation demonstrates potential as a controlled phytopharmaceutical system for managing microbial infections.

Keywords: *Curcuma caesia*, Microspheres, Antioxidant, Antimicrobial, Sodium alginate, Phytochemical screening

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HPTLC STANDARDIZATION, ESTIMATION OF TOTAL FLAVONOID AND PHENOLIC CONTENT OF EXTRACTS, AND EVALUATION OF ANTIOXIDANT ACTIVITY OF EXTRACTS IN COMBINATION

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ABSTRACT

***Background*:** The rich flora of North East regions provides beneficial herbs to manage various diseases more precisely than the synthetic chemical entities. Native plants like Curcuma longa, Centella asiatica, Aegle marmelos, Phyllanthus emblica, Paederia foetida, Mentha spicata supports innumerous health benefits corresponding to their rich antioxidant behavior.

***Objective*:** This study aimed to standardize and estimate a novel polyherbal extract using High Performance Thin Layer Chromatography (HPTLC) fingerprinting alongside evaluation of its antioxidant properties.

***Methods*:** The polyherbal extract comprising standardized extracts of interested herbs was subjected to HPTLC analysis on silica gel plates with optimized mobile phases to generate characteristic densitometric fingerprints at 254 nm and 366 nm. Distinct Rf values and peak profiles confirmed the presence of marker phytochemicals. The total phenolic content, total flavonoid content was estimated against standard Gallic acid and Quercetin respectively. Antioxidant potential was assessed via DPPH radical scavenging method and Ferric reducing antioxidant power (FRAP).

***Results*:** The results confirmed the presence of standardized marker compound and TPC and TFC was expressed (GAE/g)and (QE/g) respectively. The antioxidant potential was confirmed in the extract and their physical mixture.

***Conclusion*:** These findings establish the extract's bioactive richness and potent antioxidant efficacy, supporting its therapeutic potential in oxidative stress-related conditions.

Keywords: Polyherbal, Antioxidant, DPPH, FRAP

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FORMULATION, CHARACTERIZATION, AND *IN VITRO* EVALUATION OF BERBERINE-LOADED TRANSETHOSOMAL GEL FOR TOPICAL DELIVERY

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ABSTRACT

***Background*:** Diabetic wounds heal slowly due to impaired angiogenesis, chronic inflammation, oxidative stress, and poor drug penetration. Berberine and captopril have complementary wound-healing properties, but limited skin permeability restricts their topical efficacy. Transethosomal gel enhances skin penetration, retention, and sustained release, offering synergistic and improved therapeutic effects in diabetic wound healing.

***Objectives*:** To develop a berberine–captopril co-loaded transethosomal gel and evaluate its *in vivo* efficacy for enhanced diabetic wound healing.

***Methods*:** Transethosomes were prepared by the ethanol injection method, and drug incorporation was confirmed by UV spectroscopy and FTIR analysis. The confirmed transethosome were characterized for particle size, zeta potential, polydispersity index (PDI), entrapment efficiency, drug loading, and invitro drug release. Before gel incorporation, formulation optimization was carried out using Design of Experiments (DOE) with a Box–Behnken design, considering three dependent variables and two independent variables. The formulated transethosome was subsequently incorporated into an optimized gel and evaluated for key physicochemical properties.

***Results*:** UV–Visible spectroscopic analysis confirmed the successful incorporation of berberine into transethosomes by the presence of characteristic absorption peaks at 336 nm and 308 nm corresponding to berberine, along with secondary peaks at 273 nm and 236 nm. FTIR analysis further confirmed the interaction between berberine and the transethosomal components, indicating successful drug encapsulation. DLS analysis demonstrated the successful formation of transethosomes with an adequate particle size, PDI, and suitable zeta potential reflecting colloidal stability. Entrapment efficiency and drug loading studies confirmed effective incorporation of berberine within the vesicular system, while in-vitro drug release studies indicated controlled and sustained release behaviour.

Conclusion: The results confirm the successful development of berberine-loaded transethosomes with appropriate physicochemical properties, stable vesicular structure, and effective drug encapsulation. This transethosomal system shows strong potential as advanced topical delivery for berberine.

Keyword: Berberine, Transethosome, Diabetic Wound, Topical Gel

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PHYTOCHEMICAL CHARACTERIZATION AND STANDARDIZATION OF SELECTED MEDICINAL PLANT EXTRACTS FOR PHARMACEUTICAL APPLICATIONS

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ABSTRACT

***Background*:** Medicinal plants serve as an important source of bioactive compounds for drug discovery and formulation development. However, variability in phytochemical composition due to geographical, environmental, and processing factors necessitates proper characterization and standardization to ensure quality, safety, and reproducibility. Establishing standardized parameters is essential before their incorporation into pharmaceutical dosage forms.

***Objective*:** The present study aimed to perform phytochemical characterization and standardization of selected medicinal plants to establish quality control parameters for their potential pharmaceutical applications.

***Methods*:** Selected plant materials were collected, authenticated, and subjected to drying and pulverization. Physicochemical evaluation was performed using standard procedures, including determination of moisture content, total ash value, acid insoluble ash, water soluble ash, and extractive values in suitable solvents. Preliminary phytochemical screening was carried out to identify major classes of secondary metabolites such as alkaloids, flavonoids, tannins, saponins, glycosides, phenolics, and terpenoids. Organoleptic properties and other relevant quality parameters were also recorded to establish identification standards.

***Results and Discussion*:** The evaluated parameters demonstrated acceptable physicochemical limits, indicating good quality and minimal adulteration of plant materials. Extractive values suggested the presence of significant amounts of polar and moderately polar phytoconstituents. Phytochemical screening confirmed the presence of multiple bioactive compounds known for their therapeutic potential. The generated standardization data provide reproducible reference values that can serve as quality control benchmarks. Such systematic evaluation ensures uniformity and supports the safe utilization of plant derived materials in pharmaceutical formulations.

***Conclusion*:** The study successfully established physicochemical and phytochemical standards for selected medicinal plants, providing a scientific foundation for their quality assurance and future pharmaceutical development.

Keywords: Phytochemical characterization, Plant standardization, Physicochemical analysis, Secondary metabolites, Quality evaluation, Pharmaceutical application

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CHARACTERIZATION AND EVALUATION OF PECTIN EXTRACTED FROM THE FRUIT OF *Dillenia indica* AS A NATURAL TABLET DISINTEGRANT

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ABSTRACT

***Background*:** Natural polymers are gaining increasing importance in pharmaceutical formulations due to their biodegradability, biocompatibility, low toxicity and cost effectiveness. Pectin is a naturally occurring heteropolysaccharide, contained in the primary lamella, in the middle lamella and the cell wall of terrestrial plants. Pectin derived from the plant sources have shown potential and unique properties that enables it to use as a disintegrating agent, particularly in tablet formulation. *Dillenia indica* (commonly known as chulta, outenga or elephant apple) is a plant of Dilleniaceae family and indigenous to Southeastern Asia. The fruit *Dillenia indica* is a rich source of pectin with an optimal pectin yield of 19-20% under specific conditions.

***Objective*:** The present study aims on the extraction of pectin from the *Dillenia indica* fruit and comprehensively characterize its physicochemical, spectral, and micromeritic properties. The study further intended to evaluate the pectin's functionality as a natural disintegrate in tablet formulation by incorporating it in different concentration of aspirin formulation and comparing its disintegrating efficiency and drug release behaviour with synthetic disintegrants.

***Methods*:** The *Dillenia indica* pectin was extracted using Soxhlet method followed by acid extraction and ethanol precipitation. The isolated polymer was characterized for percentage yield, organoleptic properties, melting point, and FT-IR spectral analysis. Flow properties were assessed through angle of repose, bulk density, tapped density, Carr's index, and Hausner ratio. Aspirin tablets were made using the extracted pectin with various concentrations. The formulations were evaluated for physicomechanical parameters, in-vitro disintegration time, and dissolution behavior in simulated gastric fluid (pH 1.2). Drug release kinetics were analyzed using zero-order, first-order, Higuchi, and Korsmeyer–Peppas models.

Result and Conclusion: From the above studies, it can be concluded that the prepared pectin containing tablets showed promising results and have better disintegrating properties. Therefore, the pectin obtained from *Dillenia indica* fruit is suitable and has better disintegrating properties than starch and can be used as a good alternative for synthetic disintegrating agent.

Keywords: Pectin, *Dillenia indica*, Natural Polymer, Tablet Disintegration

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EXPLORATION OF THE ANTI-INFLAMMATORY ACTIVITY OF *Oxalis corniculata* LINN: AN INTEGRATED NETWORK PHARMACOLOGY - *IN VITRO* APPROACH

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ABSTRACT

***Background*:** Inflammation is the body's local protective response to injury, aiming to remove the harmful agent and clear damaged tissue. *Oxalis corniculata* Linn., a medicinal herb widely used in traditional systems of medicine, has been reported to possess anti-inflammatory properties, however, its molecular mechanisms remain inadequately characterized. Integrating network pharmacology with experimental validation offers a systematic approach to elucidate multi-target mechanisms of herbal medicines.

***Objective*:** The present study aimed to explore the anti-inflammatory potential of leaves of *Oxalis corniculata* Linn. using an integrated network pharmacology and *in vitro* experimental approach to identify bioactive compounds, key molecular targets, and underlying signaling pathways.

***Methods*:** Phytoconstituents of *Oxalis corniculata* were retrieved from publicly available phytochemical databases and literature. Potential targets associated with phytochemicals and inflammation were predicted using network pharmacology tools, followed by identification of common genes between phytochemicals and inflammation, protein–protein interaction (PPI) network construction, hub gene identification, Gene Ontology (GO) and KEGG pathway enrichment analyses. *In vitro* anti-inflammatory activity of leaves extract was evaluated by using inhibition of egg albumin denaturation assay.

Results and *Conclusion*: Network pharmacology analysis identified multiple bioactive compounds, including flavonoids and phenolic acids, interacting with inflammation-related targets such as TNF-α, IL-6, COX-2, and NF-κB. Enrichment analyses highlighted critical pathways involved in inflammatory signalling including the arachidonic acid metabolism, MAPK, VEGF pathway signalling. *In vitro* studies demonstrated a significant, concentration-dependent anti-inflammatory effect of *Oxalis corniculata* extract, corroborating the predicted multi-target regulatory mechanisms. The IC50 value of standard Ibuprofen and methanolic extract was found to be 2.73 µg/ml and 2.02 µg/ml in egg albumin denaturation assay.

The integrated network pharmacology and *in vitro* approach revealed that *Oxalis corniculata* Linn. exerts anti-inflammatory activity through modulation of multiple targets and pathways. These findings provide mechanistic insights supporting its traditional use and suggest its potential as a source of multi-target anti-inflammatory agents for further preclinical and clinical investigations.

Keywords: Inflammation, *Oxalis corniculata*, Network Pharmacology, Multidrug-multitarget.

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IN SILICO ANALYSIS OF PHYTOCHEMICAL FROM *Heracleum nepalense* D. DON AGAINST COX-1/COX-2 ENZYME FOR ANTI-INFLAMMATORY ACTIVITY

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ABSTRACT

Background: *Heracleum nepalense* D. Don is a small shrub with medicinal properties, belonging to the Apiaceae family. It grows at elevations of 1750-4000 meters above sea level and exhibits various therapeutic benefits, including: Antibacterial activity, Anti-inflammatory activity, Antioxidant activity and antidiarrheal activity. The plant grows up to 2 meters in moist areas during monsoon and produces winged fruits, which are dried and taken orally.

Objective: To assess the anti-inflammatory efficacy of *Heracleum nepalense* D. Don's phytochemicals against COX-1 and COX-2 enzymes via in silico molecular docking and dynamics simulations.

Methodology: The present study investigates its anti-inflammatory activity through in-silico molecular docking and dynamics simulations performed with Maestro software (Schrodinger 2024-2). A set of phytochemical ligands—curcumin monoglucoside, 3-O-Methylquercetin, syringin, bixin, bergaptol, catechol, and L-kynurenine—were selected for docking with the cyclooxygenase enzymes COX-1 and COX-2.

Results and Conclusion: The docking results revealed that curcumin monoglucoside obtained the highest binding score of –10.032 kcal when docked with the COX-2 protein 3PGH, indicating strong affinity. Syringin followed with a score of –8.255 kcal when docked with the COX-1 protein 7JXT. Molecular dynamics simulations confirmed that the complexes of curcumin monoglucoside with 3PGH (COX-2) are stable, showing effective ligand-protein interactions. Further analysis demonstrated that curcumin monoglucoside binds well with key amino acids of the COX-2 active site, namely TYR-355, ARG-120, and GLU-524, suggesting its potential as an effective anti-inflammatory agent.

Keywords: Anti-inflammatory, Heracleum Nepalense D.Don, Molecular Docking, Molecular Dynamics

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PIPERINE, A MIRACLE PHYTOMOLECULE, AS BIOENHANCER: A REVIEW OF ITS EFFECT ON PHARMACOKINETIC AND PHARMACODYNAMICS OF DRUGS

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ABSTRACT

***Background*:** Piperine, a bioactive alkaloid extracted from *Piper nigrum* (black pepper), has been utilized for centuries in traditional medicine and culinary practices. Recent research has unveiled its potential as a bioenhancer, significantly enhancing the bioavailability and therapeutic efficacy of various nutrients and pharmaceuticals. By inhibiting metabolic enzymes and modulating transport mechanisms, piperine improves the absorption and utilization of co administered compounds. Piperine, an active compound derived from black pepper, exhibits significant potential as a bioenhancer, impacting both pharmacokinetic and pharmacodynamic profiles of various drugs. Its ability to inhibit enzymes like cytochrome p450 and udp-glucuronosyltransferase leads to increased bioavailability and reduced metabolism of co-administered drugs, thus amplifying their therapeutic effects. Additionally, piperine enhances drug absorption by modulating membrane dynamics and permeability and inhibits the p-glycoprotein efflux pump, which often limits drug absorption.

Pharmacodynamically, piperine works synergistically with various drugs, enhancing their efficacy without possessing notable therapeutic effects itself. This synergistic action has been observed across a wide range of therapeutic areas, including diabetes, cancer, inflammation, and cardiovascular diseases. By increasing the concentration of drugs in the bloodstream, piperine helps achieve better therapeutic outcomes at potentially lower doses, reducing the risk of side effects.

***Objective*:** To study Pharmacokinetic properties that altered by piperine. Pharmacodynamic properties that altered by piperine. Pharmacological properties that altered by piperine. Piperine as a bioavailability enhancer in disease conditions. Formulation strategies for enhancing bioavailability.

Result and *Conclusion*: In Conclusion, piperine role as a bioenhancer offers a promising avenue for improving the efficacy and safety profiles of numerous pharmacological treatments. Its unique ability to enhance drug absorption, bioavailability, and overall effectiveness highlights its potential as a valuable adjunct in various therapeutic regimens. Further research is warranted to fully explore and harness piperine bio enhancing properties in clinical practice.

Keywords: piperine, bioenhancer, drug bioavailability, enzyme inhibition, drug absorption, synergistic effects, therapeutic efficacy, clinical applications

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SPRAYABLE NANOEMULSION-BASED FOAM: A NOVEL APPROACH FOR ENHANCED TOPICAL DRUG DELIVERY

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ABSTRACT

***Background*:** Sprayable nanoemulsion-based foam is an innovative topical drug delivery system developed to enhance drug penetration and improve patient compliance compared to conventional creams and gels. Nanoemulsions consist of oil, surfactant, co-surfactant, and water, forming nanosized droplets that enhance solubility and stability of poorly water-soluble drugs.

***Objectives*:** To briefly review the formulation principles and therapeutic potential of sprayable nanoemulsion-based foam for topical applications.

***Methods*:** A narrative review of recent pharmaceutical literature was conducted, focusing on nanoemulsion formulation, foam integration, and key evaluation parameters.

Results and *Conclusion*: Reduced droplet size in nanoemulsions improves dermal permeation and drug bioavailability. Incorporation into a sprayable foam base enhances spreadability, rapid absorption, and uniform distribution while providing a non-greasy and patient-friendly application. Critical factors such as droplet size, entrapment efficiency, and thermodynamic stability determine formulation performance. Sprayable nanoemulsion-based foam represents a promising platform for effective and convenient topical drug delivery.

Keywords: Nanoemulsion, Sprayable Foam, Topical Delivery, Dermal Penetration

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EXPLORING MEDICINAL PLANTS OF NORTH-EAST INDIA FOR ANTI-INFLAMMATORY AND ANTICANCER POTENTIAL: AN *IN SILICO* APPROACH

Projolita Gogoi[1]*, Malini Lohar[1]*, Maitrayee Baruah[1]*, Bichitra Kumar Doley[1], Ankita Kashyap[1], Jon Jyoti Sahariah[2], Sheikh Rezzak Ali[2]

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ABSTRACT

***Background*:** North-East India is a well-known biodiversity hotspot rich in medicinal flora traditionally employed against inflammatory disorders and cancer. Persistent inflammation is closely associated with cancer initiation and progression, highlighting the need for multi-target therapeutic approaches. However, many phytoconstituents from this region remain insufficiently explored at the molecular level. The present work focuses on the computational evaluation of selected plant-derived compounds for their potential role in inflammation-associated cancer.

***Objectives*:** To systematically investigate phytochemicals derived from medicinal plants of North-East India using integrated in-silico approaches, including network pharmacology and molecular docking, in order to identify potential multi-target therapeutic candidates against inflammation-associated cancer into elucidate their underlying molecular mechanism.

***Methods*:** A systematic literature survey was carried out to identify medicinal plants of North-East India reported to possess anti-inflammatory and anticancer activities. Forty-three phytochemicals belonging to major classes such as flavonoids, phenolic acids, curcuminoids, alkaloids, terpenoids, glycosides, and fatty acids were compiled. The selected compounds were assessed for physicochemical properties, drug-likeness, and toxicity profiles. Network pharmacology analysis was performed to construct compound–target–disease interaction networks and to identify key regulatory proteins and pathways. Molecular docking studies were subsequently conducted to evaluate binding affinities with selected targets.

Results: Most of the screened phytochemicals demonstrated acceptable drug-likeness and safety parameters. Pharmacological analysis using network pharmacology approach revealed prominent multi-target interactions involving important inflammatory mediators and cancer-related pathways, indicating a polypharmacological mode of action. Docking studies further supported strong binding tendencies of several compounds toward crucial protein targets, reinforcing their therapeutic relevance.

***Conclusion*:** The study provides a computational perspective on inflammation-driven carcinogenesis and identifies medicinal plants of North-East India as valuable sources of multi-target bioactive compounds. The findings support further experimental valida`tion and future drug discovery efforts based on these phytochemicals.

Keywords: Molecular Docking, North-East India Medicinal Plants, Inflammation-associated Cancer

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PHYTOCHEMICAL QUANTIFICATION, TLC AND HPTLC STANDARDIZATION OF ANTHOCYANIN-RICH EXTRACT OF *Oryza sativa* L BLACK RICE FROM MANIPUR

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ABSTRACT

***Background*:** *Oryza sativa* L. cv Amubi, commonly known as Chakhao Amubi a Manipuri black rice, is a pigmented rice variety rich in anthocyanins and other polyphenolic compounds. These Black rice is often served as side dish during function, gathering, and religious festival. It is rich in Anti-oxidant. Different types of food based are available in market that include Chakhao tan (Black rice Roti), Chakhao Bujia, Chakhao Gulla, Chakhao Laddu. This black rice is believed to help prevent diabetes and heart disease by the local people from Manipur.

***Objective*:** The present study was designed to quantify total phenolic, flavonoid, and anthocyanin contents using microplate-based *Methods* and to establish TLC and HPTLC fingerprint profiles of anthocyanin-rich extract of *Oryza sativa*.

***Methodology*:** Fresh unpolished rice material was collected, shade-dried, finely powdered and defatted using petroleum ether. The marc was then subjected to hot mild extraction with acidified ethanol to obtain anthocyanin-rich extract. Total Phenolic Content (TPC) and Total Flavonoid Content (TFC) was estimated using the Folin–Ciocalteu and aluminum chloride colorimetric method and expressed as mg Gallic Acid Equivalent (GAE) and Quercetin Equivalent (QE) per gram of extract. Additionally, total Anthocyanin Content (TAC) was assessed using the pH differential method and expressed as mg cyanidin-3-glucoside equivalent per gram of extract. Further, TLC and HPTLC analyses were performed on silica gel 60 F254 plates using ethyl acetate: water: formic acid (10:3:3) as the mobile phase. Cyanidin chloride was used as a reference standard, and Rf values were documented after densitometric scanning.

***Results and Discussion*:** The extract exhibited levels of phenolic, flavonoid, and anthocyanin contents as determined by microplate-based assays. TLC analysis showed clear, well-resolved spots comparable with cyanidin chloride standard. HPTLC chromatograms demonstrated distinct peaks with good resolution, and the major peak of the extract showed Rf value closely matching that of the standard, confirming the presence of cyanidin derivatives. The developed microplate quantification *Methods* along with TLC and HPTLC fingerprint profiling provide a reliable, rapid, and reproducible approach for standardization and quality control of *Oryza sativa* extract.

Keywords: Chakhao Amubi, *Oryza sativa* L., Anthocyanins, HPTLC Fingerprinting, Total Phenolic Content, Black Rice

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IN VIVO HEPATOPROTECTIVE EVALUATION OF *Sicyos edulis* ON WISTAR ALBINO RATS

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ABSTRACT

***Background*:** The liver is known for synthesizing enzymes, metabolism, and excretion of drugs and food. However, during biological processes, the abnormality occurs in the liver, which becomes a significant global health burden in humans, characterized by loss of synthetic function, breakdown of blood, irregular vitamin K, and localized, permanent changes to parenchymal cells.

***Objective*:** The study was designed to research the Phytochemical and biological screening of *Sicyos edulis* leaf for hepatoprotective activity on laboratory animals using paracetamol and methotrexate models.

***Methods*:** The study evaluated liver toxicity in healthy Wistar albino rats using two *in vivo* models. Each study group consists of six animals. In the first model, paracetamol was administered at 1mg/kg b.w. (p.o). for seven days. Similarly, in the second model, methotrexate was administered 20mg/kg, b.w. (p.o). Both models were challenged with methanolic extract of Sicyos edulis leaf (MESEL) at doses of 100mg/kg (low) and 200 mg/kg (high) p.o. for seven days, respectively. On day 8th, the blood samples were collected from the tail vein and analysed for various biochemical parameters.

Results: MESEL successfully restored the elevated serum biomarker levels in our study. The decrease in AST was observed by removing toxic metabolites, the reduction in ALT was due to an increase in ATP synthesis in mitochondria, thereby modulating the balance of liver energy metabolism, the decrease in ALP is due to tissue regeneration, and an increase in TP denotes the restoration of protein imbalance from liver injury. At different concentrations, all these effects strengthen the liver, regulate body metabolism, and ultimately inhibit further liver cell damage in favour of their regeneration. Our study also evidences the protective action of MESEL in rats against the Paracetamol and methotrexate model.

***Conclusion*:** The current study confirms the MESEL protective action in rats against the Paracetamol and Methotrexate model. Furthermore, the quote was very promising as evidenced by the reversal of altered values after administration, most likely by promoting hepatocyte regeneration.

Keywords: Hepatoprotective, *Sicyos edulis*, liver toxicity

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HERBAL MEDICINES: CURRENT STATUS AND FUTURE PROSPECTS IN HEALTHCARE AND DRUG DEVELOPMENT

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ABSTRACT

***Background*:** Medicinal plants have been used since ancient times for the treatment of various diseases. Growing concerns regarding the side effects of synthetic drugs have increased global interest in herbal medicines and natural remedies.

***Objective*:** The present study aims to highlight the current status and future prospects of herbal medicines and their role in modern healthcare and drug development.

***Methods*:** The study is based on a comprehensive review of published literature related to medicinal plants and herbal medicines. Information was collected from scientific articles, books and other reliable sources focusing on commonly used medicinal plant families such as Asteraceae, Liliaceae, Apocynaceae, Solanaceae, Caesalpinaceae, Rutaceae, Piperaceae, and Sapotaceae.

Results: Medicinal plants contain several bioactive compounds that contribute to their therapeutic properties. Many modern drugs are derived from natural sources and nearly 70% of medicines in India are linked to plant-based products. Medicinal plants are widely used in traditional healthcare and also serve as important commercial commodities. However, India contributes only about 1.6% to the global herbal market.

***Conclusion*:** Scientific validation, standardization and sustainable utilization of medicinal plants are essential to enhance their therapeutic potential and increase India's contribution to the global herbal medicine market.

Keywords: Herbal Medicines, Medicinal Plants, Natural Products, Drug Development

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IN SILICO SCREENING OF QUINOLINE DERIVATIVES AS ANTI-TUBERCULOSIS AGENTS

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ABSTRACT

***Background*:** The *Mycobacterium tuberculosis* (MTB) is responsible for causing chronic severe infectious illness known as tuberculosis (TB) and mostly targets the lung along with other organs. The spread of MTB has been exacerbated by the continuous evolution and emergence of strains and therefore are not easily affected by the anti-Tuberculosis Agent. Multidrug-resistant (MDR) and drug-resistance are the common issues associated with these new strains. To stop the spreading of the disease, especially in the worsen scenario of MDR-TB along with variants that are resistant to drugs, it is more important than ever to create innovative, efficient and rapid acting anti-TB medications. Because of inherent challenges regarding the creation of novel anti-TB drugs, despite the fact that many compounds have been synthesized for this goal in recent years, only a small number of these compounds have progressed to human trials following the discovery of rifampicin.

***Objective*:** The main *Objective*s of this study is to design and analyze quinoline derivatives as potential anti-tuberculosis agents, to perform *in silico* molecular docking against against targeted protein.

***Methods*:** The study was carried out using computational drug-discovery techniques which involves designing of structure by using chem draw, drug likeness analysis by using Molinspiration cheminformatics, toxicity study by using Osiris data warrior and molecular docking by using PyRx software.

Results & Discussion: Several quinoline derivatives showed strong binding affinity toward the selected TB target proteins, the docking analysis indicated stable hydrogen bonding and hydrophobic interaction.

***Conclusion*:** After analyzing all the criteria, including binding energy, ligand protein interaction, toxicity data, molecular properties study, compound S24 and S22 were found as the best analogues. In the future, these analogues can be synthesized and tested in *in vitro* to confirm the anti-tuberculosis potency.

Keywords: MTB, MDR-TB,TB, *In silico* molecular docking

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FORMULATION AND CHARACTERIZATION OF KARANJIN-LOADED NANOSTRUCTURED LIPID CARRIERS FOR POTENTIAL BREAST CANCER THERAPY

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ABSTRACT

***Background*:** GLOBOCAN 2022 data reports that 29% of all new female cancer cases come under the breast cancer category, accounting for highest number of cases of incidence in India. This calls for finding therapeutic solutions on understanding the various molecular players associated with etiopathology of the disease. Since centuries, karanjin has been used in Ayurvedic medicine for the amelioration of various wounds and parasitic skin infections. Karanjin shows potential biological effects both *in vivo* and *in vitro*. Having low solubility in spite of high permeability, karanjin falls under BCS II category. Nanostructured lipid carriers emerged as a promising platform for addressing the pharmacokinetic challenges of hydrophobic drugs like karanjin. NLCs comprise of solid and liquid lipids which offer advantages such as improved drug solubility, maximum drug loading and improved bioavailability. Therefore, an attempt has been made to delineate the solubility parameter of karanjin in the form of Nanostructured Lipid Carrier (NLC).

***Objective*:** The present study aimed to develop and characterize karanjin-loaded nanostructured lipid carriers (NLCs) as a potential drug delivery system for breast cancer therapy.

***Methods*:** Karanjin-loaded NLCs were formulated using suitable combinations of solid and liquid lipids to improve drug solubility and encapsulation efficiency. The prepared formulations were characterized to evaluate their physicochemical properties and stability. The developed nanocarriers are intended for further biological evaluation in breast cancer cell lines such as MCF-7 to assess their effect on cell viability at physiologically relevant concentrations.

Results: Karanjin-loaded nanostructured lipid carriers were successfully formulated and characterized, demonstrating improved solubility and drug loading potential. The nanoscale carrier system indicates enhanced suitability for delivery of poorly soluble compounds

***Conclusion*:** Karanjin-loaded NLCs represent a promising nanotechnological approach to overcome the solubility limitations of karanjin and improve its therapeutic potential for breast cancer treatment. Further studies, including cell viability assays, will help evaluate the anticancer efficacy of this formulation.

Keywords- Breast Cancer, Karanjin, Nanostructured Lipid Carrier (NLC), Cell viability

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GUT–LIVER AXIS MEDIATED TOLL LIKE RECEPTOR 4(TLR-4) ACTIVATION IN NON-ALCOHOLIC FATTY LIVER DISEASE (NAFLD): MECHANISTIC INSIGHTS INTO DISEASE PROGRESSION

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ABSTRACT

***Background*:** Non-alcoholic fatty liver disease (NAFLD) is one of the major causes of chronic liver diseases across the world and is closely related to metabolic imbalances in addition to chronic inflammation. Increasing evidence highlights the critical role of the Gut–liver axis in the initiation and progression of NAFLD. The gut and liver are anatomically and functionally connected through the portal circulation, allowing microbial metabolites and endotoxins derived from the intestine to directly influence hepatic physiology. Dysbiosis of the gut microbiota and increased intestinal permeability facilitate the translocation of lipopolysaccharide (LPS) into the portal vein, which subsequently activates Toll-like receptor 4 (TLR4) expressed on hepatic immune cells, particularly Kupffer cells.

***Objective*:** The proposed study will review the role of gut microbiota dysbiosis in triggering the TLR4 signaling in the liver and to highlight the molecular mechanisms through which this pathway contributes to the progression of NAFLD.

***Methods*:** A systematic literature search was conducted on the recent scientific databases (PubMed, Scopus and Web of Science) of peer-reviewed literature. Relevant studies published in recent years focusing on gut microbiota alterations, intestinal permeability, TLR4-mediated inflammatory signaling, and their role in NAFLD progression were reviewed and incorporated.

Results: Evidence from multiple studies indicate that intestinal dysbiosis contributes to the increase in intestinal permeability, entry of LPS to the portal vein, and stimulation of Toll-like receptor 4 of hepatic immune cells and Kupffer cells in particular. Activation of TLR4 triggers downstream signaling cascades involving MyD88-dependent pathways and the activation of NF-kB, leading to the release of pro-inflammatory cytokines such as TNF-α and IL-6. This inflammatory process results in the hepatic steatosis, destruction of liver cells and the development of non-alcoholic steatohepatitis and liver fibrosis.

***Conclusion*:** The gut–liver axis plays an important role in the pathogenesis of NAFLD through TLR4-mediated inflammatory signaling. The knowledge of this mechanistic relationship can be of great importance when developing new treatment strategies aimed at modulating gut microbiota and inhibiting TLR4-activation to prevent the development of NAFLD.

Keywords: Non-alcoholic fatty liver disease, Gut–liver axis, Toll-like Receptor 4, NF-kB signaling.

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IN SILICO DESIGN AND EVALUATION OF ANTIMALARIAL ACTIVITY OF DIFFERENT NOVEL DERIVATIVES OF PHYTOCHEMICALS FROM NORTH-EASTERN INDIA

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ABSTRACT

***Background*:** Over the last decade, the development and spread of resistance to every first-line antimalarial drug has been a concern in the fight against malaria. This highlights the urgent need to explore traditional plants, used as an antimalarial along with their phytochemical components.

***Objective*:** This study focuses on phytoconstituents from plants of Northeast India, aiming to design 15 novel compounds using *in silico* approaches and to find safer, more effective therapies from derivatization of these natural phytoconstituents that can help to overcome the growing resistance.

***Methods*:** Through a proper literature review, phytoconstituents containing antimalarial effect were collected. Using ChemDrawUltra 8.0.3 novel derivatives of these phytoconstituents were designed. For generation of docking input files BIOVIA discovery studio software was employed while PyRx software is used to evaluate the binding energy of the prepared ligands.

Results: The *in silico* analysis revealed that 10 novel structures showed promising binding affinity towards the target protein when compared with the native ligand and the standard drug Chloroquine.

***Conclusion*:** The structural modifications of the phytoconstituents caused a significant increase in the binding affinity towards the targeted protein. Therefore, new modifications and optimization along with further research are necessary to improve the observed activity.

Keywords: Phytoconstituents, *In silico* study, Northeast India, Antimalarial

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EXPLORING THE THERAPEUTIC POTENTIAL OF *Melastoma malabathricum* AND ITS APPLICATIONS IN TRADITIONAL MEDICINES

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ABSTRACT

***Background*:** *Melastoma malabathricum* L., a medicinal plant belonging to the family Melastomataceae, has been widely used in traditional medicine systems across South and Southeast Asia for the treatment of various ailments. Different parts of the plant, including leaves, roots, flowers, and fruits, are traditionally used to manage gastrointestinal disorders, wounds, inflammation, infections, haemorrhagic diseases, and metabolic disorders. Phytochemical studies have reported the presence of several bioactive constituents such as flavonoids, tannins, phenolic acids, triterpenoids, saponins, etc.

***Objective*:** The present review aims to explore the traditional medicinal uses, phytochemical composition, and pharmacological activities of *Melastoma malabathricum*.

***Methods*:** Relevant scientific literature was collected and analysed from published research articles focusing on the ethnomedicinal applications, phytochemical constituents, and experimentally validated pharmacological activities of *M. malabathricum*.

Results and Conclusion: Experimental studies have demonstrated that various extracts and isolated compounds from *M. malabathricum* exhibit significant antioxidant, anti-inflammatory, antimicrobial, antidiabetic, hepatoprotective, gastroprotective, wound-healing, and anticancer activities. These pharmacological effects are primarily attributed to its strong free-radical scavenging capacity, modulation of inflammatory mediators, and regulation of important biochemical pathways. Despite its promising pharmacological potential, the clinical application remains limited due to variability in phytochemical composition, lack of standardization, and insufficient clinical evidence. However, recent advances in herbal drug research and formulation technologies may facilitate the development of standardized formulations and enhance the therapeutic potential of *M. malabathricum*.

Keywords: Phytochemicals, Medicinal plants, Pharmacological activities, Traditional Medicine.

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ALBEDO EXTRACT OF *Citrus macroptera* TARGETS BIOFILM, VIRULENCE, AND STRESS PATHWAYS IN *Escherichia coli* O157:H7: MOLECULAR EVIDENCE AND HOST SURVIVAL ASSAY IN *Caenorhabditis elegans*

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ABSTRACT

***Background*:** *Citrus macroptera* (Satkara), a traditionally valued medicinal plant indigenous to Southeast Asia, possesses significant ethnomedicinal and culinary importance. Infectious diseases continue to raise a major global public health threat due to antimicrobial resistance and limited therapeutic options. Therefore, exploring traditionally used medicinal plants represent a promising strategy for novel antimicrobial discovery.

***Objective*:** This study aimed to evaluate the antibacterial potential and host survival activity of a 70% ethanolic extract derived from the albedo of *Citrus macroptera*.

***Methods*:** The albedo extract was prepared using 70% ethanol and evaluated for antibacterial activity against eight bacterial strains. The most susceptible bacterial strain was further analysed through minimum inhibitory concentration, minimum bactericidal concentration, membrane depolarization analysis, and biofilm inhibition studies. Gene expression profiling was performed using RT-qPCR, and host survival activity was assessed using the nematode infection model *Caenorhabditis elegans*.

***Results and Conclusion*:** Among the tested pathogens, *Escherichia coli* O157:H7 exhibited the highest susceptibility to the extract. Mechanistic investigations demonstrated bactericidal activity at 4×MIC, significant membrane depolarization, and substantial biofilm biomass reduction. RT-qPCR analysis revealed downregulation of major virulence-associated genes along with upregulation of stress and SOS response markers. Host survival assay using *Caenorhabditis elegans* confirmed enhanced host survival without significant adverse effects. Overall, these findings highlight the albedo of *C. macroptera* as a potent and underexplored source of natural antimicrobials in therapeutic research, supporting its further development in plant-based antimicrobial drug discovery.

Keywords: *C. macroptera*, Anti-bacterial activity, Host survival activity, *Caenorhabditis elegans*.

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AGENTIC AI IN PHARMACOVIGILANCE: HARNESSING SOCIAL MEDIA FOR PROACTIVE DETECTION OF ADVERSE DRUG REACTIONS ASSOCIATED WITH OVER-THE-COUNTER MEDICATION

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ABSTRACT

***Background*:** Pharmacovigilance (PV) systems have historically relied on patients' and healthcare professionals' spontaneous reporting, however, ADRs associated with over-the-counter (OTC) medications are significantly under-reported due to a lack of awareness or only shared on social media platforms and others. Recent developments in artificial intelligence (AI) have given rise to the idea of agentic AI, which refers to autonomous systems that are able to gather, examine, and decipher massive datasets to monitor possible signals.

***Objective*:** To review the potential of Agentic Artificial Intelligence in pharmacovigilance for proactively detecting adverse drug reactions associated with over-the-counter medications by analyzing patient-reported data from social media platforms.

***Methods*:** In order to find recent publications on the use of agentic artificial intelligence in pharmacovigilance, a narrative review was carried out by methodically searching electronic databases such as PubMed, Scopus, and Google Scholar. Adverse drug reactions, pharmacovigilance, agentic AI, social media monitoring, and over-the-counter drugs were among the terms used. The function of AI-driven systems in identifying and evaluating ADR signals from social media platforms was assessed by screening and synthesizing pertinent peer-reviewed articles, reviews, and reports

***Results and Conclusion*:** This review highlights the potential of Agentic AI to shift PV towards proactive monitoring by using social media-derived data, which enhances early detection and supports safer medication use in the community, and are capable of efficiently analyzing massive amounts of social media data in order to detect possible adverse drug reaction (ADR) signals associated with over-the-counter drugs as compared to conventional pharmacovigilance techniques. By facilitating the proactive monitoring of adverse drug reactions (ADRs) via social media, agentic AI holds great promise for improving pharmacovigilance. AI-driven surveillance may enhance early signal detection, bolster drug safety monitoring, using natural language processing (NLP) machine learning and facilitates prompt regulatory decision-making when integrated with traditional reporting systems.

Keywords: Pharmacovigilance, Agentic AI, Natural Language Processing (NLP) techniques, over-the-counter (OTC) medications, ADR handling.

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EXPLORING SYNTHESIS AND BIOLOGICAL POTENTIAL OF CHALCONE DERIVATIVES

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ABSTRACT

***Background*:** Chalcones are an important class of flavonoid compounds characterized by an α, β-unsaturated carbonyl system, which contributes to their wide range of pharmacological activities. Due to their simple structure, ease of synthesis, and diverse biological potential, chalcone derivatives have attracted significant attention in medicinal chemistry. These compounds exhibit various biological activities including antimicrobial, antioxidant, anticancer, anti-inflammatory, antiviral, and antimalarial effects. The reviewed literature highlights the growing importance of chalcone scaffolds in drug discovery and development.

***Objective*:** To review the synthesis methods of chalcone derivatives and summarize their biological activities, including antibacterial, antiviral, anticancer, and antioxidant properties, in order to highlight their potential applications in drug discovery.

***Methods*:** This review focuses on different synthetic approaches for chalcone derivatives, mainly through Claisen–Schmidt condensation using aromatic aldehydes and acetophenone derivatives under basic or acidic conditions. Various modifications such as heterocyclic substitution and hybridization with bioactive moieties have been discussed based on recent literature reports.

***Results and Conclusion*:** The findings indicate that chalcone derivatives demonstrate significant biological activities depending on structural substitutions and heterocyclic incorporation. Several synthesized chalcone hybrids showed promising antibacterial, antifungal, anticancer, and antioxidant activities, making them potential candidates for future therapeutic applications. Overall, chalcones serve as versatile and promising lead molecules in pharmaceutical research due to their structural flexibility and broad-spectrum biological properties. Further research is required to explore their mechanism of action and develop novel chalcone- based drug candidates.

Keywords: Chalcone, Anticancer, Antimicrobial.

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MULTIMODAL TOXICITY EVALUATION OF BOROPHENE NANOSHEETS: INSIGHTS FROM CELLULAR AND ANIMAL MODELS

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ABSTRACT

***Background*:** Like graphene, a well-established two-dimensional (2D) material with extensive biomedical applications, borophene also holds significant promise in this field. However, toxicological evaluations are crucial to establish its biosafety.

***Objective*:** The study presents in vitro cytotoxicity of borophene nanosheets (BNSs) in B16F10 cells, *ex vivo* cytotoxicity in animal blood samples, and in vivo toxicity studies in laboratory rats for the first time.

***Methods*:** The *in vitro* and *ex vivo* cytotoxicity studies were carried out through MTT and hemolysis assays, respectively. In a 14-day single-dose acute oral toxicity study in female Wistar rats (per OECD 423), various clinical and behavioural signs, including mortality, diarrhoea, anxiety, respiratory rate, salivation, and body weight changes, were monitored periodically. In a 28-day repeated-dose sub-acute oral toxicity study in both male and female Wistar rats (as per OECD-407), detailed haematological, serum biochemical, and histopathological evaluations were also carried out to investigate the toxic effects of BNSs on blood, kidney function, liver function, and the morphology of tissues of different major organs.

Results and Conclusion: The in vitro MTT assay in B16F10 cells and the ex vivo hemolysis assay in animal blood samples indicated no significant cytotoxic effect at the highest dose of 200 μg/mL of BNSs with 83.41 ± 9.78% cell viability and less than 5% hemolysis, respectively. The BNSs exhibited no significant toxicological signs and symptoms even at the highest dose of 2000 mg/kg body weight during the 14-day single-dose acute oral toxicity study, and up to a dose level of 200 mg/kg BW during the 28-day repeated-dose subacute oral toxicity study in Wistar rats. No mortality was observed in any of the groups of both acute and subacute toxicity studies. No significant alteration of different normal clinical and behavioural signs was observed during the entire study period. Haematological, serum biochemical, and histopathological evaluations also revealed no toxicity. This study demonstrates the nontoxicity and safety profile of BNSs and thus holds considerable promise as a safe and biocompatible 2D nanomaterial for future biomedical applications.

Keywords: Safety profiling, *In vivo* toxicity, Hemocompatibility, Borophene nanosheets.

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TRADITIONAL KNOWLEDGE TO CLINICAL LEAD: AN APPROACH TO MEDICINAL PLANTS OF NORTHEAST INDIA FOR MALARIA AND VIRAL MANAGEMENT

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ABSTRACT

***Background*:** Malaria and viral infections remain major public health concerns, particularly in tropical and subtropical regions. Increasing drug resistance and limited access to effective therapies highlight the urgent need for safer and more effective treatment strategies. Northeast India, recognized as a global biodiversity hotspot, possesses a rich diversity of medicinal plants and indigenous ethnomedicinal knowledge traditionally used to manage febrile and infectious diseases. Scientific exploration of these plant resources offers promising opportunities for identifying bioactive phytochemicals and developing novel therapeutic leads.

***Objective*:** This study investigates the therapeutic relevance of indigenous medicinal plants from Northeast India and evaluates their potential as safer and biologically active alternatives for managing malaria and viral infections. The work follows a holistic and translational research framework aiming to connect traditional healing practices with evidence-based modern pharmacotherapy.

***Methods*:** A comprehensive review and analytical synthesis were performed using ethnopharmacological records, documented traditional healing practices, and published scientific literature. Northeast India, a recognized biodiversity hotspot, possesses rich indigenous knowledge regarding treatment of fever, malaria-like illness, and viral infections. Scientific reports describing pharmacologically active phytoconstituents, including alkaloids, flavonoids, and terpenoids, were critically examined to establish correlations between traditional usage and pharmacological validation. The collected data were evaluated to identify plants with reported antiplasmodial, antiviral, anti-inflammatory, and immunomodulatory activities relevant to drug discovery.

Results and Conclusion: The investigation revealed a consistent dependence on plant-based remedies for febrile and viral illnesses across indigenous communities. There are a few species that demonstrated significant antiplasmodial and immunomodulatory activities, supporting the scientific credibility of traditional knowledge. Reported phytochemicals from these plants act as potential lead molecules for therapeutic development. These findings indicate that traditional remedies are not merely empirical but pharmacologically relevant and mechanistically explainable. Translating such remedies into standardized, quality-controlled, and affordable formulations could improve accessibility and safety of treatment. The study emphasizes integration of ethnopharmacological heritage into the translational research pipeline to promote sustainable drug discovery and culturally acceptable healthcare solutions.

Keywords: Ethanopharmacology, Antiplasmodial, Antiviral, Northeast India.

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SYNTHESIS OF BIODIESEL FROM *Glycine max* (L.) Merr. OIL AND ITS CHARACTERISATION

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ABSTRACT

***Background*:** The increasing global energy demand and depletion of fossil fuel resources have intensified the search for alternative fuels. Biodiesel is considered a promising substitute for conventional diesel due to its renewable, biodegradable, non-toxic and sulfur-free nature. Among various feedstocks, soybean Glycine max (L.) Merr. oil is widely regarded as a suitable feedstock for biodiesel production.

***Objective*:** This study aimed to synthesize biodiesel from soybean oil through the transesterification process and evaluate the quality of the produced biodiesel. It also examined the effect of different reaction times on biodiesel yield while maintaining constant reaction parameters, and compared the physicochemical properties of the produced biodiesel with ASTM D6751 fuel standards.

***Methods*:** Biodiesel was produced from soybean oil by transesterification reaction using methanol and sodium hydroxide (NaOH) as the alkali catalyst. The reaction was carried out at a methanolto-oil molar ratio of 6:1, a temperature of 60 °C and a catalyst concentration of 1.0% (w/w). Reaction time was varied (1, 1.25 and 1.5 h) to study its effect on biodiesel yield. The produced biodiesel was purified and characterized by measuring density, kinematic viscosity at 40 °C, acid number and pour point, and the results were compared with ASTM D6751 standards.

***Results and Conclusion*:** The results indicated that reaction time significantly affected biodiesel conversion efficiency. The highest biodiesel yield of approximately 80% was obtained at a reaction time of 1.25 h. Most of the measured physicochemical properties complied with ASTM D6751 standards, although the acid value was slightly higher than the recommended limit. Soybean oil is a suitable feedstock for biodiesel production via transesterification, with an optimal reaction time of 1.25 h. Further purification may be required to reduce the acid value and improve fuel quality.

Keywords: Sustainable, Catalyst, Diesel, Characterisation.

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AI-TRANSFORMED HIV DIAGNOSTICS AND NEXT-GENERATION THERANOSTICS

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ABSTRACT

***Background*:** Human Immunodeficiency Virus (HIV) is a retrovirus that infects CD4 T-cells and progressively weakens the immune system, eventually leading to Acquired Immunodeficiency Syndrome (AIDS) if untreated. It is transmitted through infected bodily fluids via unprotected sexual contact, needle sharing, or perinatal exposure. Early symptoms include fever, rash, and fatigue, while advanced stages involve opportunistic infections and cancers. Current diagnostic methods have limitations: rapid antibody–antigen tests provide results in 20–30 minutes but have a 10–90- day window period that may cause false negatives during early infection, while nucleic acid tests (PCR/NAT) allow earlier detection but remain costly and laboratory dependent.

***Objective*:** To evaluate the potential role of artificial intelligence in improving HIV diagnostics and accelerating therapeutic development.

***Methods*:** Machine learning models were applied to interpret rapid diagnostic test images and analyse single-cell sequencing data for biomarker identification. Generative AI was also used to screen large compound libraries for potential HIV inhibitors and predict antiretroviral resistance patterns.

Results and Conclusion: AI models demonstrated improved accuracy in interpreting rapid test results and enabled precise identification of HIV biomarkers. Generative AI accelerated the discovery of potential antiviral compounds and predicted resistance patterns, supporting faster therapeutic development. These AI-driven strategies could enhance early detection, improve treatment precision, and contribute to global HIV control efforts aligned with the goals of UNAIDS.

Keywords: HIV, AI, Theranostics444, CD4 T-cells.

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TARGETING MULTIPLE METABOLIC PATHWAYS OF *Plasmodium falciparum*: ANTIMALARIAL POTENTIAL OF NOVEL TRIAZOLE DERIVATIVES

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ABSTRACT

***Background*:** Malaria has been one of the leading causes of infection-induced deaths worldwide, transmitted by female Anopheles mosquito. It is an endemic vector-borne parasitic disease caused by protozoan parasites of genus Plasmodium. Among various species of Plasmodium, *Plasmodium falciparum* (Pf) causes severe malaria in humans, contributing the most to the malaria related morbidity and motility. The WHO reported that African Region carries disproportionately high share of the global malaria burden. In 2024, there were around 282 million malaria cases with 610,000 deaths in 80 countries. Despite advances in malarial chemotherapies, drug resistance of malaria has become one of the major problems in control of the disease. Drugs like Chloroquine have emerged resistance due to mutation in PfCRT gene, preventing its conversion to hemozoin. Due to growing resistance of various antimalarial drugs against Pf, targeting the metabolic pathways of the parasite has become a crucial role. Destroying the metabolic pathways can fulfil the therapeutic role of various drugs by destroying the parasites at different stages of Pf life cycle.

***Objective*:** The focus of this study is to assess the *in silico* antimalarial activity of novel series of bi- triazole derivatives, aimed to counteract drug resistance in malaria. These derivatives might have the potential for clinical deployment in control and eradication of malaria.

***Methods*:** A library of 30 bi-triazole derivatives were designed to target 7 enzymes of Pf including *Plasmodium falciparum* Dihydrofolate Reductase (PfDHFR), *Plasmodium falciparum* Lactate Dehydrogenase (PfLDH), Falcipain-2, Falcipain-3, *Plasmodium falciparum* Dihydroorotate Dehydrogenase (PfDHODH), Plasmepsin-I, Plasmepsin-II, Plasmodium falciparum Fructose- biphosphate aldolase (PfAldo). Binding affinities and key interactions will be analysed to evaluate these designed compounds against antimalarial activity.

Results and Conclusion: The goal of this study is to design a series of novel *in silico* antimalarial compounds of bi-triazole derivatives against the drug resistance malaria, enabling the identification and development of more active and selective antimalarial agents.

Keywords: Plasmodium falciparum, Dihydrofolate Reductase, Falcipain-2, Falcipain-3, Plasmepsin-I, Plasmepsin-II.

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A REVIEW ON GEL FORMULATION OF *Tinospora cordifolia* EXTRACT FOR THE MANAGEMENT OF INFLAMMATION

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ABSTRACT

***Background*:** *Tinospora cordifolia* (Guduchi) is an important Ayurvedic medicinal plant known for its anti-inflammatory and immunomodulatory properties. Its stem contains bioactive compounds that reduce inflammation and oxidative stress. Incorporating the extract into a topical gel may improve localized delivery, stability, and therapeutic effectiveness for managing inflammatory conditions.

***Objective*:** The objective of this review is to explore the potential of Tinospora cordifolia gel formulations in managing inflammation by highlighting its phytochemical profile, pharmacological activities, formulation strategies, and therapeutic advantages, while emphasizing the need for standardization and clinical validation to establish its efficacy and safety in topical applications.

***Methods*:** A comprehensive literature review was conducted using scientific databases such as PubMed, Google Scholar, and ScienceDirect. Relevant studies on Tinospora cordifolia, its phytochemical constituents, pharmacological activities, and topical gel formulations were analyzed and summarized to evaluate its potential anti-inflammatory applications.

Results and Conclusion: Previous studies report significant antioxidant and anti-inflammatory activities of Tinospora cordifolia, demonstrated through various in-vitro assays and phytochemical analyses. These findings suggest that extract-based herbal gels may serve as promising natural topical formulations for managing inflammation, though further clinical studies are required.

Keywords: Giloy, Herbal gel, Inflammation.

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DEVELOPMENT AND EVALUATION OF A POLYHERBAL TRANSDERMAL PATCH OF *Datura metel* AND *Cocculus indicus* EXTRACT FOR THE MANAGEMENT OF MOTION SICKNESS

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ABSTRACT

***Background*:** Motion sickness is a prevalent vestibular disorder characterized by nausea, vomiting, dizziness, and discomfort during travel. Conventional therapies, though effective, are often associated with sedation and systemic side effects.

***Objective*:** The present study aimed to formulate and evaluate a polyherbal transdermal patch incorporating hydro-ethanolic extracts of *Datura metel* leaves and *Cocculus indicus* seeds for controlled management of motion sickness.

***Methods*:** The extracts were prepared using solvent extraction followed by concentration under reduced pressure employing a rotary evaporator. The concentrated extracts were incorporated into a polymeric matrix system to develop transdermal patches by solvent casting technique. The prepared patches were characterized for physicochemical parameters including thickness, weight uniformity, folding endurance, surface pH, moisture content, drug content uniformity, and in-vitro diffusion studies using Franz diffusion cell. Stability studies were conducted as per ICH guidelines. Preliminary evaluation on healthy human volunteers was carried out to assess anti-motion sickness efficacy and skin irritation potential.

***Results and Conclusion*:** The developed formulation demonstrated satisfactory physicochemical properties, sustained drug release profile, and minimal skin irritation. The polyherbal transdermal system may provide a promising alternative to oral antiemetic therapy for motion sickness with improved patient compliance and reduced systemic adverse effects.

Keywords: motion sickness, Transdermal patch, Scopolamine, *Cocculus indicus*.

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A REVIEW ON THE CAUSES AND RISK FACTORS ASSOCIATED WITH HAIRFALL

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ABSTRACT

***Background*:** Hair fall (alopecia) is a common dermatological concern affecting individuals across different age groups. It can lead to significant psychological stress which reduce self-esteem and impaired quality of life. It occurs due to disturbance in the normal hair growth cycle. It can be due to various internal and external factors such as genetic predisposition, hormonal imbalance, nutritional deficiencies, stress, medical conditions and environmental influences. Therefore, understanding of underlying causes and associated risk factors are necessary to implement proper diagnosis, prevention and effective management to improve patient care system.

***Objective*:** To summarize the major possible causes and risk factors associated with hair fall.

***Methods*:** To address this, A comprehensive literature review was carried out to identify the major causes and risk factors associated with hair fall (alopecia). Relevant scientific articles were collected from electronic databases such as PubMed, Google Scholar and other academic sources. This approach helped in compiling reliable information regarding the underlying causes and risk factors of alopecia.

***Results and Conclusion*:** Hair fall is a multifactorial condition influenced by genetic, physiological, environmental and lifestyle-related factors. Lifestyle factors such as poor diet and inadequate hair care routines, hormonal changes and nutritional deficiencies of iron, protein, vitamin D and zinc as well as stress, certain medications, autoimmune disorders, harsh cosmetic practices increase the risk for hair loss. So, early identification of underlying cause is crucial for effective treatment and prevention of hair loss. A comprehensive approach involving proper diagnosis, balanced nutrition, stress management and appropriate medical intervention can help to reduce severity of alopecia and improve overall health of the hair.

Keywords: Hair fall, alopecia, vitamin D

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ARTIFICIAL INTELLIGENCE-DRIVEN AUTHENTICATION AND QUALITY CONTROL OF HERBAL MEDICINES: CURRENT ADVANCES AND FUTURE PERSPECTIVES

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ABSTRACT

***Background*:** The rapid growth in the global herbal medicine market has intensified concerns regarding adulteration, misidentification, contamination, and variability in bioactive constituents. Conventional authentication and quality control methods, including microscopy and chromatographic fingerprinting, are often time-consuming and dependent on expert interpretation.

***Objective*:** This review aims to highlight current advances in artificial intelligence (AI) techniques for authenticating herbal medicines and ensuring quality control, and to discuss future perspectives on their practical implementation.

***Methods*:** Recent literature was analyzed focusing on machine learning (ML), deep learning (DL), and chemometric tools integrated with DNA barcoding, spectroscopy, chromatography, and metabolomic profiling techniques. AI models such as convolutional neural networks (CNN), support vector machines (SVM), and random forest algorithms have been applied for species identification, adulteration detection, and chemical fingerprint analysis.

***Results and Conclusion*:** AI-driven systems demonstrated high accuracy, sensitivity, and rapid processing capabilities compared to conventional methods. Image-based plant identification, spectral pattern recognition, and predictive modeling for quality assessment significantly improved reliability and reproducibility. Integration with real-time monitoring tools enhances quality assurance during processing and storage. AI has strong potential to transform herbal medicine authentication and quality control by improving precision, efficiency, and scalability. Future integration with blockchain for supply-chain traceability and explainable AI models may further strengthen regulatory acceptance and global standardization.

Keywords: Artificial intelligence, Herbal authentication, Quality control, Machine learning.

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QUALITATIVE DETECTION OF MILK ADULTERANTS: A SCIENTIFIC PERSPECTIVE ON FOOD SAFETY

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ABSTRACT

***Background*:** Milk is a foundational dietary component worldwide, yet its purity and safety are increasingly compromised by adulteration practices that pose significant public health risks. This study aimed to qualitatively detect common adulterants in marketed milk and selected dairy products and to assess consumer exposure and awareness of potential health hazards.

***Objective*:** A series of standard qualitative chemical tests were employed to screen for adulterants in milk, curd, and paneer samples sourced from diverse brands and local suppliers. Targeted adulterants included starch, sodium chloride, sugars, ammonium compounds, boric acid, hydrogen peroxide, nitrates, and formalin, using reagent-based assays designed for rapid and cost-effective detection. The analytical approach was complemented by a structured field survey to evaluate patterns of milk consumption, consumer knowledge about adulteration, and reported health effects.

***Method*:** Milk samples from local vendors and commercially packaged brands were collected from different areas of Dibrugarh town. In addition to milk, dairy products such as curd and paneer were also sampled to broaden the scope of adulteration assessment. Qualitative analysis was performed using standard reagent-based chemical tests to detect common adulterants. These included iodine test for starch, silver nitrate test for sodium chloride, specific reagent tests for sugars, ammonium compounds, boric acid, hydrogen peroxide, nitrates, and formalin. Approximately 5 mL of each sample was subjected to the respective assays under controlled laboratory conditions using standard laboratory glassware and reagents. Observations were recorded based on characteristic color changes or precipitate formation indicating the presence of adulterants.

Results and Conclusion: Results revealed that sodium chloride was detected in all milk samples, suggesting deliberate addition to mask dilution or adjust taste. Nitrates were present in multiple samples, indicating possible environmental contamination or adulteration. Sugar adulteration was identified in a limited number of products. Most hazardous adulterants, including hydrogen peroxide, boric acid, and ammonium compounds, were not detected, reflecting some adherence to regulatory standards. However, the presence of formalin in one branded milk sample highlights a serious safety breach due to its known toxicological effects. Notably, both curd and paneer samples were free from detectable adulterants. Survey responses demonstrated low consumer awareness of adulteration issues and a correlation between adulterated milk consumption and reported gastrointestinal and systemic symptoms among vulnerable population groups. In conclusion, milk remains highly susceptible to chemical adulteration, and regular monitoring, public education, and stringent regulatory enforcement are critical to protect public health. Simple, rapid qualitative testing methods offer practical tools for early detection and mitigation of adulteration in dairy supply chains.

Keywords: Milk adulteration, Qualitative analysis, Food safety, Dairy products

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CITRUS OF NORTHEAST INDIA: ETHNOBOTANICAL WEALTH AND THERAPEUTIC PROMISE – A REVIEW

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ABSTRACT

***Background*:** Citrus species (family Rutaceae) are among the most widely consumed fruits globally due to their distinctive flavour, texture, and recognised nutritional and therapeutic value, exhibiting remarkable genetic diversity resulting from considerable interspecific and intraspecific hybridisation. It includes major fruit crops cultivated in Mediterranean and subtropical regions, such as oranges, mandarins, lemons, limes, pomelos, and grapefruits. These fruits are highly valued for their organoleptic qualities and their rich phytochemical composition, particularly their high vitamin C (ascorbic acid) content and diverse bioactive compounds. Northeast India, owing to its unique geographical location and favourable environment, is known as the "citrus depository" and is a centre of origin and diversity for several citrus species. The region harbours numerous indigenous and underutilised varieties with significant ethnomedicinal relevance, however, many remain scientifically underexplored.

***Objective*:** This review aims to provide a comprehensive overview of the phytochemical composition of citrus varieties found in Northeast India, their traditional uses, and their potential therapeutic applications and value-added citrus products. By emphasising the scientific and economic potential of citrus biodiversity in Northeast India, this work seeks to promote further research and aid conservation efforts of these valuable genetic resources.

***Methods*:** It synthesises existing research on the bioactivities of citrus-derived compounds and identifies research gaps and understudied species.

***Results and Conclusion*:** Citrus across plant parts possess diverse phytoconstituents with antioxidant, antibacterial, antifungal, anticancer, and anti-metabolic effects, and underexplored species i.e., *C. indica*, *C. latipes* can be studied for bioactivity based on their traditional use. By-products and wastes from citrus offer value-added opportunities, and cross-sector applications span the pharmaceutical, cosmetics, food, and nutraceuticals sector. This review links the existing phytochemical and bioactivity data with traditional uses and prioritises underutilised citrus for rigorous pharmacological validation, and promotes integrated, sustainable utilisation of NE Indian citrus biodiversity, linking ethnomedicine with translational research.

Keywords: Citrus species, bioactive compounds, economic potential

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POLYHERBAL FORMULATIONS IN THE MANAGEMENT OF MOUTH ULCER

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ABSTRACT

***Background*:** Mouth ulcers are a common condition characterized by the breakdown of the oral mucosal membrane. These ulcers can be triggered by a variety of etiological factors, including chemical irritants, dental injuries, nutritional deficiencies, hormonal fluctuations, genetic predispositions, and the consumption of acidic foods. Traditionally, herbal medicines and their preparations have been used in various therapies. The wide variety of herbs display promise antiulcer qualities by modifying several physiological and biochemical processes involved in ulcer development. Their antibacterial and anti-inflammatory properties further support for treating the complex etiology of ulcers. Combining natural herbs and components into specific formulas can lead to various antagonistic, supportive, restraining, or enhancing effects. Polyherbal formulations eliminates the need to give many herbal formulations at once.

***Objectives*:** To review and summarize the the therapeutic efficacy of polyherbal formulations in the treatment of oral ulcers, emphasizing medicinal plants, their phytochemical components, and the dosage forms accessible for oral ulcer management.

***Methods*:** A literature study was performed utilizing published scientific publications, review papers, and databases on herbal therapy. Information regarding herbal plants utilized in the therapy of mouth ulcers, their phytoconstituents, and mechanisms of action was gathered and studied to comprehend the efficacy of polyherbal formulations in managing oral ulcers.

***Results and Conclusion*:** This review emphasizes the efficacy of polyherbal formulations in the treatment of oral ulcers. These formulations integrate many herbs to target numerous variables contributing to ulcer development, alleviating pain, reducing inflammation, and facilitating tissue repair. Polyherbal treatments seem to be a safe and natural alternative for treating oral ulcers, nevertheless, further research is required to determine appropriate dosages.

Keywords: Mouth ulcer, Herbal plants, Polyherbal formulation

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COMPREHENSIVE ASSESSMENT OF PHYTOCHEMICALS, ANTIOXIDANT ACTIVITY, AND QUANTIFICATION OF TOTAL PHENOLIC AND FLAVONOID CONTENTS IN *Melastoma malabathricum* L

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ABSTRACT

Background: *Melastoma malabathricum* L., commonly known as Indian rhododendron and locally called Phutukola, is a medicinal plant widely used in traditional medicine. The plant has been reported to possess several pharmacological properties including antiviral, antiparasitic, cytotoxic, anticoagulant, antidiarrheal, wound healing, antiulcer, anti-inflammatory, antioxidant, and antipyretic activities. Due to the increasing interest in plant-derived natural antioxidants, scientific evaluation of its phytochemical constituents and biological activities is essential.

Objective: The present study aimed to evaluate the phytochemical composition and investigate the antioxidant and anti-inflammatory potential of the ethanolic extract of *Melastoma malabathricum*.

Methods: The plant material was taxonomically authenticated by Dr. N. Odyuo, Scientist-E and Head **of** Office (HoO), Shillong, India, and a voucher specimen was deposited (Herbarium No.: DU/DS/2025/01). Preliminary phytochemical screening was performed to identify major bioactive constituents. Antioxidant activity of the ethanolic extract was assessed using the DPPH radical scavenging assay. Total phenolic content (TPC) was determined using the Folin–Ciocalteu method, while total flavonoid content (TFC) was estimated by the aluminium chloride colorimetric method.

***Results and Conclusion*:** Phytochemical analysis revealed the presence of several bioactive compounds including phenolics, flavonoids, saponins, alkaloids, glycosides, tannins, triterpenoids, and carbohydrates. The ethanolic extract demonstrated notable antioxidant activity with a radical scavenging activity of 61.331 ± 0.033% and an IC_{50} value of 70.102 ± 1.57 µg/mL. The total phenolic content was 69.9 ± 7.01 mg GAE/g, while the total flavonoid content was 58.23 ± 2.345 mg QE/g of extract. The results indicate that *Melastoma malabathricum* possesses significant antioxidant potential, which may be attributed to its high phenolic and flavonoid content. These findings suggest that the plant could serve as a promising natural source of antioxidants and may play a protective role against oxidative stress–induced neuronal damage.

Keywords: *Melastoma malabathricum*, Antioxidant, Phenolic content, 2,2-Diphenyl-1-picrylhydrazyl

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PHYTOCHEMICAL STANDARDIZATION AND IN-VITRO ASSESSMENT OF THE ANTIOXIDANT AND ANTI-INFLAMMATORY ACTIVITIES OF *Alternanthera philoxeroides* (Mart.) Griseb.

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ABSTRACT

***Background*:** Traditional medicinal plants represent an important source of bioactive compounds with therapeutic potential against oxidative stress and inflammation, which play a significant role in the development of chronic diseases. *Alternanthera philoxeroides* (Alligator weed) is traditionally used in folk medicine and contains diverse phytoconstituents, however, systematic evaluation of its hydroalcoholic extract for antioxidant and anti-inflammatory activities remains limited.

***Objective*:** The present study aimed to investigate the in vitro antioxidant and anti-inflammatory potential of the hydroalcoholic extract of *Alternanthera philoxeroides*, along with preliminary phytochemical and physicochemical characterization.

***Methods*:** The plant material was collected and taxonomically authenticated by the Botanical Survey of India, Shillong, Meghalaya. Total phenolic content and total flavonoid content were quantified using standard spectrophotometric methods. Antioxidant activity was evaluated through radical scavenging assays and the reducing power assay using ascorbic acid as the reference standard. Anti-inflammatory activity was assessed using the egg albumin denaturation assay, with diclofenac sodium as the standard drug.

Results and Conclusion: The hydroalcoholic extract exhibited concentration-dependent free radical scavenging activity, significant ferric reducing capacity, and notable inhibition of protein denaturation compared with the standard drugs. The observed biological activities may be attributed to the presence of phenolic and flavonoid secondary metabolites in the extract. These findings indicate that the hydroalcoholic extract of *Alternanthera philoxeroides* possesses significant antioxidant and anti-inflammatory properties, supporting its potential as a natural therapeutic candidate for managing oxidative stress–mediated inflammatory conditions. Further studies are required to isolate the active compounds and elucidate the underlying mechanisms.

Keywords: Medicinal plants, Antioxidant activity, Anti-inflammatory activity, Secondary metabolites.

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CURCUMIN AS A MULTIFUNCTIONAL NUTRACEUTICAL: FROM FOOD TO PHARMA

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ABSTRACT

***Background*:** Curcumin, a yellow pigment in the Indian spice Turmeric (*Curcuma longa*), which is chemically known as diferuloylmethane, was first isolated two centuries ago in 1815 by two German Scientists, Vogel and Pelletier. Curcumin is a polyphenolic compound responsible for turmeric's characteristic flavor, aroma, and diverse pharmacological activities. Numerous studies have indicated that curcumin is a highly potent antimicrobial agent and has been shown to be active against various chronic diseases including various types of cancers, diabetes, obesity, cardiovascular, pulmonary, neurological and autoimmune diseases. To date, over 100 different clinical trials have been completed with curcumin, which clearly show its safety, tolerability and its effectiveness against various chronic diseases in humans.

***Objective*:** The present review aims to highlight the pharmacological diversity, broad spectrum health benefits, clinical relevance, and therapeutic potential of curcumin as a multifunctional nutraceutical, emphasizing its role in disease prevention, health promotion, and its transition from traditional dietary use to modern food and pharmaceutical application.

***Methods*:** A comprehensive literature search was conducted to collect relevant studies on curcumin as a nutraceutical and pharmaceutical agent. Scientific databases such as PubMed, Google Scholar, and Web of Science were used to identify peer-reviewed articles.

***Results and Conclusion*:** Curcumin exhibits a broad spectrum of pharmacological effects including anti-inflammatory, antioxidant, antimicrobial, anticancer, and hepatoprotective activities. Despite its therapeutic potential, its clinical application is limited due to poor aqueous solubility, low bioavailability, rapid metabolism, and systemic elimination. However, its inclusion into functional foods and dietary supplement support its growing role in preventive healthcare. Curcumin represents a promising multifunctional nutraceutical with significant potential in both food and pharmaceutical sectors, supporting its transition from a traditional dietary component to a scientifically validated therapeutic agent.

Keywords: Curcumin, Nutraceutical, Bioavailability.

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HERBAL FORMULATIONS FOR GUT MICROBIOME MODULATION IN INFLAMMATORY BOWEL DISEASE (IBD): A PROMISING THERAPEUTIC APPROACH

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ABSTRACT

***Background*:** Inflammatory Bowel Disease (IBD) is a chronic inflammatory disorder characterized by an imbalance in the gut microbiome, known as dysbiosis. Current treatments for IBD, such as aminosalicylates, corticosteroids, and biologics, have limitations, including adverse effects, loss of response, and high costs. This has prompted interest in alternative therapies, including herbal formulations, which have been used for centuries in traditional medicine to treat various diseases, including gastrointestinal disorders.

***Objective*:** This review aims to summarize the scientific evidence on herbal formulations for gut microbiome modulation in IBD, highlighting their potential as adjunctive therapies to conventional treatments.

***Methods*:** The gut microbiome's role in IBD was examined, focusing on dysbiosis and its impact. Herbal formulations (curcumin, aloe vera, *Boswellia serrata*, *Glycyrrhiza glabra*) were reviewed for their effects on gut microbiome and IBD symptoms. The potential synergistic effects of combining these herbal formulations with conventional therapies were also explored.

Results and Conclusion: Herbal formulations demonstrated anti-inflammatory, antioxidant, and prebiotic effects, modulating the gut microbiome, promoting beneficial bacteria (Bifidobacterium, Lactobacillus), reducing inflammation (TNF-α, IL-6), and alleviating IBD symptoms. Curcumin-phytosome complex and aloe vera gel extracts showed enhanced bioavailability and efficacy. Herbal formulations offer a promising therapeutic approach for IBD management by modulating the gut microbiome and reducing inflammation. Further clinical trials and standardization efforts are needed to ensure their efficacy and safety. This review highlights the potential of herbal formulations as adjunctive therapies for IBD, warranting further exploration.

Keywords: Herbal Formulations, Gut Microbiome, Inflammatory Bowel Disease (IBD), Dysbiosis

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MOLECULAR DOCKING AND ANTIBACTERIAL STUDIES OF SILVER SULFADIAZINE AGAINST WOUND-ASSOCIATED PATHOGENS

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ABSTRACT

***Background*:** Wound infections are a major healthcare challenge due to colonization of pathogenic microorganisms that delay the normal wound healing process. Topical antimicrobial agents play an important role in preventing infection and promoting tissue repair. Silver Sulfadiazine is widely used in burn therapy and infected skin lesions because of its broad-spectrum antimicrobial activity.

***Objective*:** The present study aimed to evaluate the antibacterial activity of silver sulfadiazine against common wound-associated pathogens and to investigate its interaction with microbial target proteins using molecular docking techniques.

***Methods*:** Molecular docking was performed using AutoDock to analyze the binding affinity and interaction of silver sulfadiazine with selected bacterial proteins. Additionally, antibacterial activity was assessed against wound pathogens including *Staphylococcus aureus* and *Pseudomonas aeruginosa* using standard microbiological techniques.

Results and Conclusion: The docking results demonstrated favorable binding interactions, suggesting potential inhibition of bacterial proteins essential for growth and survival. Antibacterial evaluation showed significant inhibition of bacterial growth, confirming the effectiveness of silver sulfadiazine as a topical antimicrobial agent. The combined computational and experimental findings support the therapeutic role of silver sulfadiazine in the management of infected wounds. Integration of in-silico approaches with microbiological evaluation provides valuable insights into drug–pathogen interactions and supports the development of improved wound-healing therapies.

Keywords: Silver sulfadiazine; Molecular docking; Antibacterial activity; Wound infection

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PHYTOCHEMICAL INVESTIGATION OF MEDICINAL PLANT TRADITIONALLY USED FOR THE TREATEDMENT OF MALARIA

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ABSTRACT

***Background*:** India as being an overall mortality rate of 83% in the reports of WHO Southeast Asia Region. Fatalities have risen to 10% in contrast to prior years. Drug under computer aid technology like chloroquine, primaquine, artemether-lumefantrine, artesunate-pyronaridine etc showed less potency as observed by TES (WHO 2025). Therefore, necessity for discovery of a distinctive targeted therapeutic medication to treat malaria is emerging. WHO interested in recording the utilization of traditional medicinal plants by indigenous peoples across the globe to resources the therapeutic drug. The current studies will help in the future research platform for identification of bioactive compounds.

***Objectives*:** To investigate the phytochemical constituents of medicinal plant sample through extraction, preliminary phytochemical screening, Liquid chromatography–mass spectrometry (LC-MS), Thin layer chromatography (TLC) analysis.

***Methods*:** Dried material was extracted using hot percolation with solvent increasing polarity. Liquid chromatography–mass spectrometry (LC-MS), Thin layer chromatography (TLC) analysis.

Result and Conclusion: Current study area Kolasib District was selected since its unique known of using ethnomedicine. Root of *Hedyotis scanden*, a Rubiaceae family, is traditionally used for treatment of Malaria symptoms. Phytochemical screening indicated the presence of alkaloids, flavonoids, phenols, glucosides, steroids and terpenoids. LC-MS analysis identified the phytoconstituents present in the sample extract and TLC analysis separated the phytochemical constituents using optimized mobile phase revealed different bands indicate bioactive compounds. Combined analytical approach provides valuable insight into the chemical composition and supports its traditional medicinal use. These studies will serve as a research baseline foundation for upcoming pharmacological and phytochemical scientific research on antimalarials.

Keywords: *Hedyotis scanden*, LCMS, TLC, Malaria,

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DESIGN, SYNTHESIS, IN SILICO, EVALUATION OF ANTI-DIABETIC ACTIVITY OF NOVEL FLAVONE BENZIMIDAZOLE DERIVATIVES

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ABSTRACT

Background: Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycaemia resulting from defects in insulin secretion, insulin action, or both, and is associated with serious long-term complications affecting multiple organs. Although several antidiabetic drugs are available for clinical use, their long-term effectiveness is often limited by adverse effects, inadequate glycaemic control, and poor patient compliance, highlighting the need for safer and more effective therapeutic agents. Flavone and benzimidazole scaffolds are widely recognized in medicinal chemistry for their diverse pharmacological activities, including antioxidant, enzyme inhibitory, and glucose-regulating properties.

Objective: The present study focuses on the design, synthesis, and in silico evaluation of novel flavone benzimidazole derivatives as potential antidiabetic agents.

Method: A series of hybrid molecules were designed by combining the flavone nucleus with substituted benzimidazole moieties using a rational multistep synthetic approach aimed at generating structurally diverse compounds. In silico evaluation was performed to predict the antidiabetic potential of the designed derivatives. Molecular docking studies were carried out against key carbohydrate-digesting enzymes, namely α-glucosidase and α-amylase, to assess binding affinity and interaction patterns within the active sites. In addition, computational prediction of drug-likeness and pharmacokinetic properties was carried out to evaluate absorption, distribution, metabolism, and excretion parameters.

Results: Toxicity prediction studies further indicated acceptable safety profiles for the majority of the designed compounds. Overall, the results of the design, synthesis, and in silico evaluation suggest that flavone benzimidazole derivatives represent promising lead candidates for the development of novel antidiabetic agents.

Conclusion: The findings provide a strong computational foundation for further experimental validation and optimization in future studies.

Keywords: Diabetes mellitus, flavone, benzimidazole

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DESIGN, SYNTHESIS, AND EVALUATION OF N-AMINO PHTHALIMIDE-SUBSTITUTED SYNTHETIC *S*-TRIAZINE DERIVATIVES AS POTENTIAL ANTI-ALZHEIMER AGENTS

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ABSTRACT

Background and Objective: This study employed a structure-based drug design approach to develop, evaluate, and screen a library of N-amino phthalimide–substituted 1,3,5-triazine derivatives as potential anti-Alzheimer agents.

Method: First, a library of 180 compounds was created by attaching various heterocyclic groups to the 1,3,5-triazine core. In silico screening—including molecular property analysis, toxicity prediction, ADME profiling, and molecular docking—successfully narrowed down the initial set to 10 promising candidates for synthesis.

Results: Docking studies against AChE (1EVE) and BuChE (4TPK) demonstrated strong binding affinities, key hydrogen bonds, and π-interactions with active-site residues, consistent with experimental findings. In vitro testing using the Ellman method identified compound 1B20 as the most potent AChE inhibitor (IC_{50} = 1.79 μM), while 1B21 showed the best BuChE inhibition (IC_{50} = 7.65 μM), though both were less effective than donepezil. Microwave-assisted synthesis yielded high yields and confirmed the compounds' structures.

Conclusion: Overall, the results underscore the importance of piperazine and aminopyridine substituents on the triazine core, suggesting that these compounds are promising candidates for further development as effective anti-Alzheimer treatments.

Keywords: Anti-Alzheimer's agents, N-amino phthalimide, Microwave-assisted synthesis

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