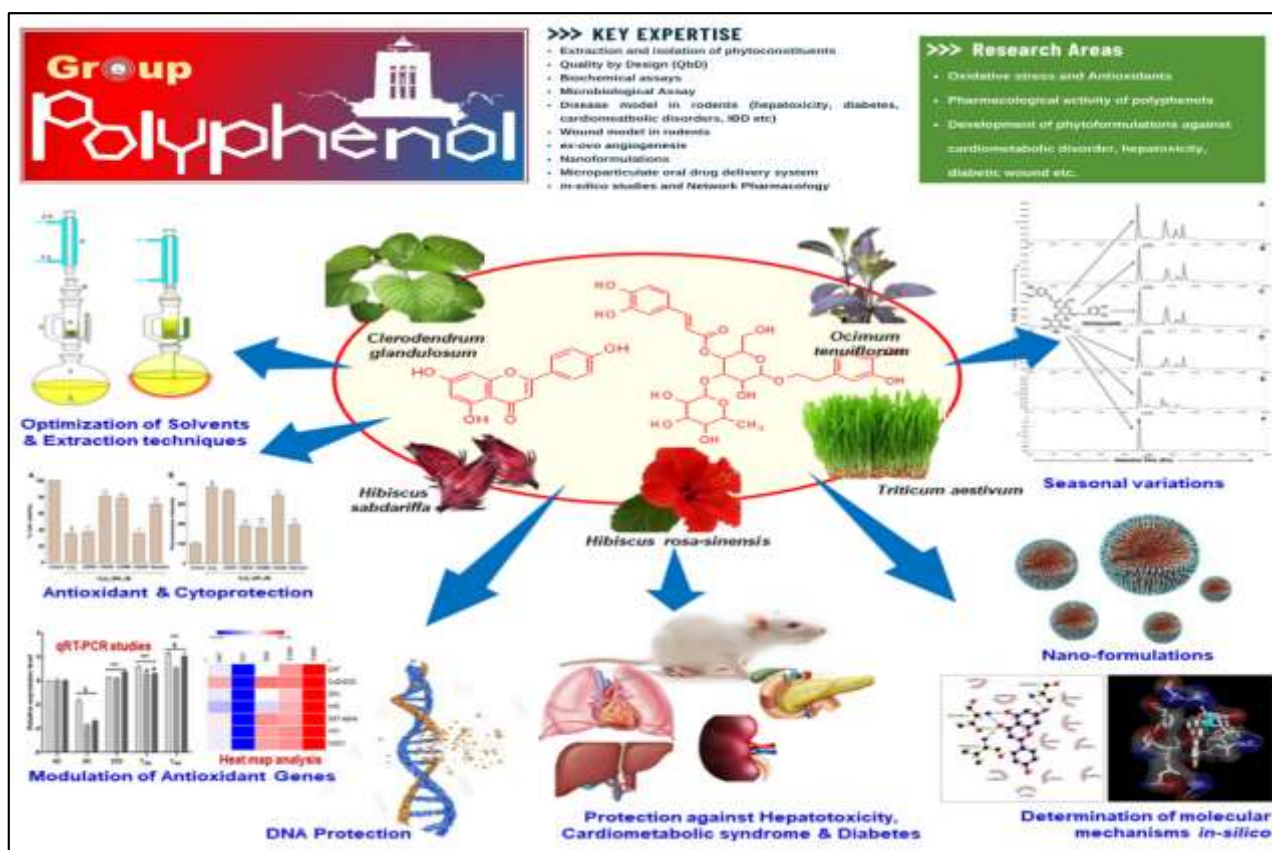


Research Group- Polyphenol-BIT

- Name of Principal Investigator/ Group Leader: Dr. Biswatrish Sarkar
- Research Theme:
- Broad Area of Research:
 - Oxidative stress and Antioxidants
 - Pharmacological activity of polyphenols
 - Clinical applications of herbs and natural products in medicine



Schematic Representation of Broad Area of Research



Total Number of Publications by the group: 42

Top 5 Article:

1. Kumar, S., Jain, A., **Sarkar, B.** (2025). Exploring the Molecular Mechanisms of *Ocimum tenuiflorum* Linn. Against Crohn's Disease: A Network Pharmacology and Molecular Modelling Approach. Chemistry & Biodiversity. 0:e03091. <https://doi.org/10.1002/cbdv.202403091> (Impact factor 2.5).
2. Saha R, **Sarkar B.** Application of response surface methodology towards the development of a phenylethanoid-based silver nanoparticle with multifaceted biological properties. New Journal of Chemistry. 2025;49(3):1030-42. (Impact factor 2.5).

3. Chatterjee, A., **Sarkar, B.** (2025). Polyphenols and terpenoids derived from *Ocimum* species as prospective hepatoprotective drug leads: a comprehensive mechanistic review. *Phytochemistry Reviews*, 24, 2087–2129 <https://doi.org/10.1007/s11101-024-09992-2> (Impact factor 7.6)
4. Majie, A., Saha, R., Sarkar, A., Bhowmik, R., Karmakar, S., Sharma, V., Deokar, D., Haque, A. U., Tripathy, S. S., **Sarkar, B.** (2024). A novel chitosan-PEG hydrogel embedded with in situ silver nanoparticles of *Clerodendrum glandulosum* Lindl. extract: Evaluation of its in vivo diabetic wound healing property using an image-guided machine learning model. *RSC Biomaterials Science*, 12, 4242-4261 <https://doi.org/10.1039/D4BM00349G> (Impact factor 5.8)
5. Adhikary, M., Mukhopadhyay, K., **Sarkar, B.** (2021) Flavonoid-rich wheatgrass (*Triticum aestivum* L.) diet attenuates diabetes by modulating antioxidant genes in streptozotocin- induced diabetic rats. *Journal of Food Biochemistry*. 45 (4): e13643. <https://doi.org/10.1111/jfbc.13643> (Impact factor 3.5)

Patents by the group:

Sl. No	Title	Application No. & Date	Status
1	Rodent behavioral assessment apparatus	424485-00; 17.02.2025	Granted
2	Floating dialysis plate for drug release	412110-001; 30.01.2025	Granted
3	Rota rod apparatus for rat	418681-001; 05.08.2024	Granted
4	A method for formulating phytochemical-based cardioprotective composition	202431045123; 06.9.24	Published
5	Microsphere-based gel for wound care with controlled drug release applications and method of synthesis thereof	202331089113; 26.1.24	Published
6	A nanofibre mat for managing wound healing, formulation and method of preparation thereof	202331078733; 01.12.23	Published
7	Polyphenolic phytochemical-reduced nanoparticles and method of synthesis thereof, for improving bioactivity	202331071055; 27.10.23	Published
8	Bioactive extract reduced <i>in-situ</i> nanoparticle-based hydrogel formulation and preparation method thereof, for wound care	202331066305; 20.10.23	Published
9	A method for fortification of whole grain puffed rice	202331036336; 06.10.23	Published

Research Projects:

Title	Role	Funding Agency	Amount (in Lacs)	Duration
QbD based approaches and mechanistic studies towards development of verbascoside loaded topical formulations to treat diabetic wound	PI	SERB-EMEQ	40.537	2022-2025
Development of non-destructive process technology for simultaneous micronutrient fortification and bioavailability enhancement in Dal through selective binding of phytic acid	Co-PI	Dept. of Biotechnology	57.90	2021-2024
Phyto-chemical characterization of polyphenols in <i>Ocimum tenuiflorum</i> and investigation on its protective potentials against oxidative stress and DNA damage	PI	SERB-EMR	34.23	2018-2021
Design and Synthesis of Substrate Based Peptide Inhibitors of DENV Protease for the Treatment of Dengue Viral Infections	Co-PI	SERB-EMR	45.604	2017-2020
Study on hepatoprotective properties and expression of antioxidant enzymes by anthocyanins from <i>Ocimum tenuiflorum</i>	PI	Seed Money Scheme (BIT, Mesra)	0.8	2015-2017
Study of Antioxidant and DNA Protective Properties of Anthocyanins	Co-PI	UGC, Major	10.8	2009-2012

Project 1: Development of polyphenol enriched microparticulate formulation against inflammatory bowel disease

Problem Statement:

Inflammatory bowel disease (IBD) is increasing worldwide, with current treatments often limited by side effects and reduced efficacy. Polyphenols offer therapeutic potential as a safer alternative, but their clinical use is hindered by low bioavailability due to poor

Publication

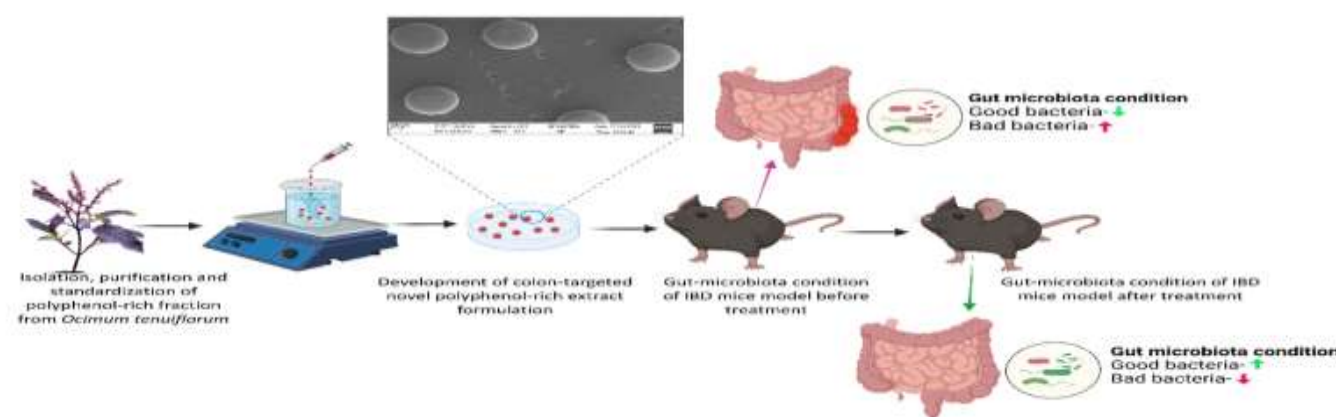
Kumar, S., Jain, A., Sarkar, B. *Chemistry & Biodiversity* (2025) 0:000001

Strategy

To develop and optimize a colon-targeted oral formulation of polyphenol-rich *Ocimum tenuiflorum*, Ch-Alg microspheres were prepared via complex coacervation using biocompatible materials (Ch, Alg, and Eudragit RS100) for effective microencapsulation.

Applications

- **Targeted Drug Delivery:** Microsphere formulations can provide sustained release, ensuring prolonged exposure of colonic tissue to therapeutic agents.
- **Protection of Polyphenols from Degradation:** Polyphenols are often unstable in acidic environments and susceptible to enzymatic degradation.
- **Modulation of Gut Microbiota:** Colon-targeted



Project 2: QbD based approaches and mechanistic studies towards development of different phenylethanoid glycoside (PhGs) loaded topical formulations to treat diabetic wound

Problem Statement:

- Diabetes impedes the wound healing process.
- This leads to chronic ulcers/ wounds, mostly in the lower extremities
- Major cause of amputation across the world.
- Only a few effective therapeutic remedies are available.

Applications

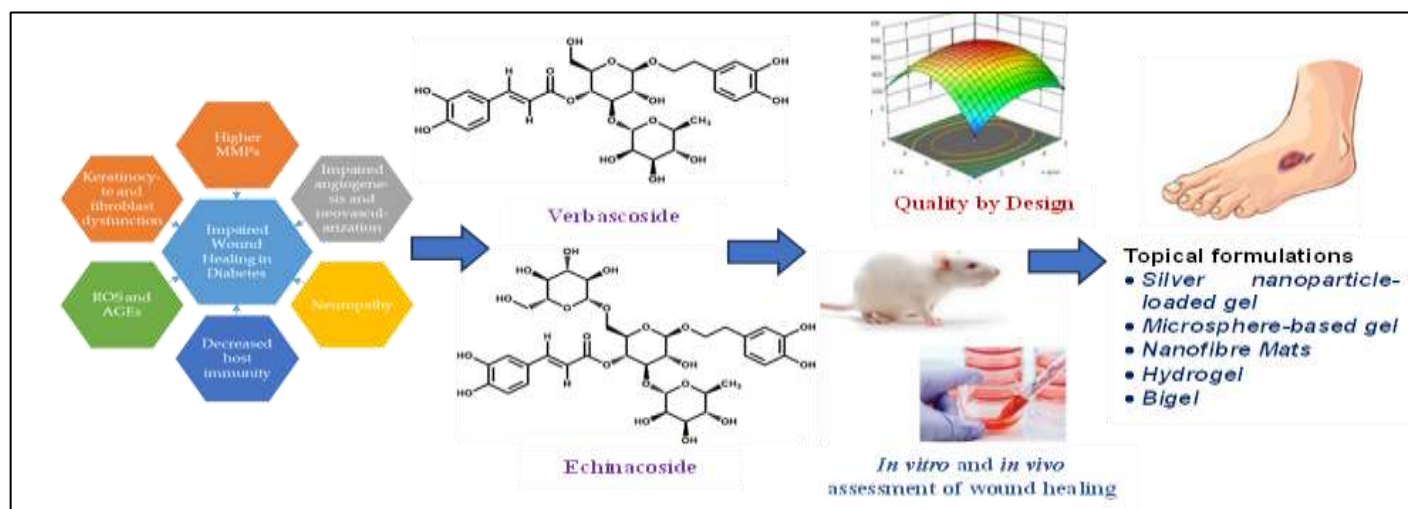
- Formulation of novel topical formulation for wound
- Identification of the molecular mechanism of wound healing by PhGs

Strategy

- Isolation, purification and characterization of PhGs from *Clerodendrum* species
- Quality by Design (QbD) approach for development of topical formulations using purified PhGs
- *in-vitro* and *In-vivo* studies to elucidate the molecular mechanisms and efficacy of PhGs loaded topical formulations to treat diabetic wound.

Publication & Patents

- Saha, R., Sarkar, B. *New Journal Chemistry* (2025), 49, 1030-1042
- *Patent 1*: Microsphere-based gel for wound care with controlled drug release applications and method of synthesis thereof (Appl. No.: 202331089113A & Date: 26.01.24).
- *Patent 2*: A nanofibre mat for managing wound healing, formulation and method of preparation thereof (Appl. No.: 202331078733A & Date: 01.12.23).
- *Patent 3*: Polyphenolic phytochemical-reduced nanoparticles and method of synthesis thereof, for improving bioactivity (Appl. No.: 202331071055 & Date 27.10.23)



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