Masters Thesis Information Showcase
Spring/Fall Semester-2026
Year 2026

Department: Chemistry
Programme: Master of Science
Specialization: Industrial Chemistry

1	**Title of the Thesis** **Isolation and synthesis of derivatives of eriodyctiol and its applications.**
2	**Abstract** (min 300 to 500 words) Eriodictyol is a naturally occurring flavanone widely distributed in citrus fruits and several medicinal plants, most notably *Eriodictyon californicum* (Yerba Santa). It possesses well-documented antioxidant, anti-inflammatory, antimicrobial, antidiabetic, hepatoprotective, neuroprotective, and anticancer properties, largely attributable to its catechol-type hydroxyl substitution pattern. Despite its considerable pharmacological potential, the therapeutic application of eriodictyol is limited by its low natural abundance, poor aqueous solubility, and low oral bioavailability. The present study was therefore designed to isolate eriodictyol from a natural plant source, synthesize structurally modified derivatives to address these limitations, and evaluate their biological activity. Eriodictyol was isolated from the leaves of *Eriodictyon californicum* through solvent extraction using methanol, followed by liquid–liquid partitioning and purification by silica gel column chromatography and preparative thin-layer chromatography. The isolated compound was structurally confirmed using ultraviolet-visible (UV-Vis) spectroscopy, Fourier-transform infrared (FT-IR) spectroscopy, nuclear magnetic resonance (^{1}H and ^{13}C NMR, including DEPT-90 and DEPT-135), and mass spectrometry. Structural derivatization of eriodictyol was carried out at its reactive hydroxyl positions via base-mediated O-alkylation reactions using potassium carbonate in anhydrous acetone under reflux. Three derivatives were synthesized by reacting the brominated flavonoid intermediate with thiamine hydrochloride, hydrochlorothiazide, and trifluoromethyl benzyl bromide (TFMB), respectively, yielding the corresponding products in high yield (up to 87.2%). Each derivative was characterized using UV-Vis, FT-IR, ^{1}H NMR, ^{13}C NMR, and mass spectrometry to confirm successful structural modification and retention of the core flavanone skeleton. The biological activities of Eriodictyol and its derivatives were tested using antioxidant (DPPH/ABTS radical scavenging), α-glucosidase inhibition, and urease inhibition assays. Among the tested compounds, the 4-dimethylpyridine-related derivative exhibited the highest antioxidant activity (78.5%), surpassing Eriodictyol itself (69.4%). Derivatives bearing the fluorinated benzyl moiety demonstrated markedly enhanced α-glucosidase inhibitory activity (up to 85.3%), while compounds containing fluorinated and amine functionalities showed strong urease inhibition (up to 95.1%). These findings demonstrate that targeted structural modification of Eriodictyol significantly enhances its biological activity profile relative to the parent compound, supporting a clear structure–activity relationship. The synthesized derivatives, particularly those bearing fluorinated substituents, show considerable promise as candidates for the development of

	antioxidant and enzyme-inhibitory therapeutic agents, with potential applications in the management of oxidative stress and diabetes-related complications
3	**Impact on SDG#___"** (min 500 words) This research on the isolation, derivatization, and biological evaluation of eriodictyol contributes meaningfully to several **major United Nations Sustainable Development Goals (SDGs)**: **SDG 3: Good Health and Well-Being** This is the most directly relevant goal. The study explores eriodictyol and its synthetic derivatives as potential candidates for managing oxidative stress, diabetes-related complications (via α-glucosidase inhibition), and other chronic conditions linked to inflammation and enzymatic dysregulation. By improving the solubility, stability, and bioactivity of a naturally derived compound, this work supports the development of affordable, plant-based alternatives to conventional pharmaceuticals, contributing to broader access to effective and safe medicines. **SDG 9: Industry, Innovation, and Infrastructure** The structural derivatization strategies developed here — using base-mediated O-alkylation to modify a natural flavonoid scaffold — demonstrate innovative synthetic approaches that can be scaled and adapted for pharmaceutical and nutraceutical industries. This supports the advancement of green, innovative chemical processes in drug discovery and natural product-based industrial applications. **SDG 12: Responsible Consumption and Production** By utilizing a naturally occurring, plant-derived compound and applying resource-conscious extraction and purification techniques, this research promotes sustainable use of natural resources. Future work aimed at microbial or fermentation-based biosynthesis of eriodictyol (as noted in the recommendations) further supports environmentally responsible, low-waste production methods as alternatives to resource-intensive plant harvesting or petrochemical-based synthesis. **SDG 15: Life on Land** Since eriodictyol is sourced from terrestrial plants such as *Eriodictyon californicum* and citrus species, sustainable and standardized extraction protocols support the responsible use of plant biodiversity, encouraging conservation-conscious sourcing practices rather than overexploitation of wild plant populations. **SDG 17: Partnerships for the Goals** This work reflects the broader global scientific collaboration in natural product and medicinal chemistry research, drawing on international literature, standardized analytical methods, and shared scientific infrastructure — reinforcing the value of cross-institutional knowledge exchange in advancing health-related research outcomes.
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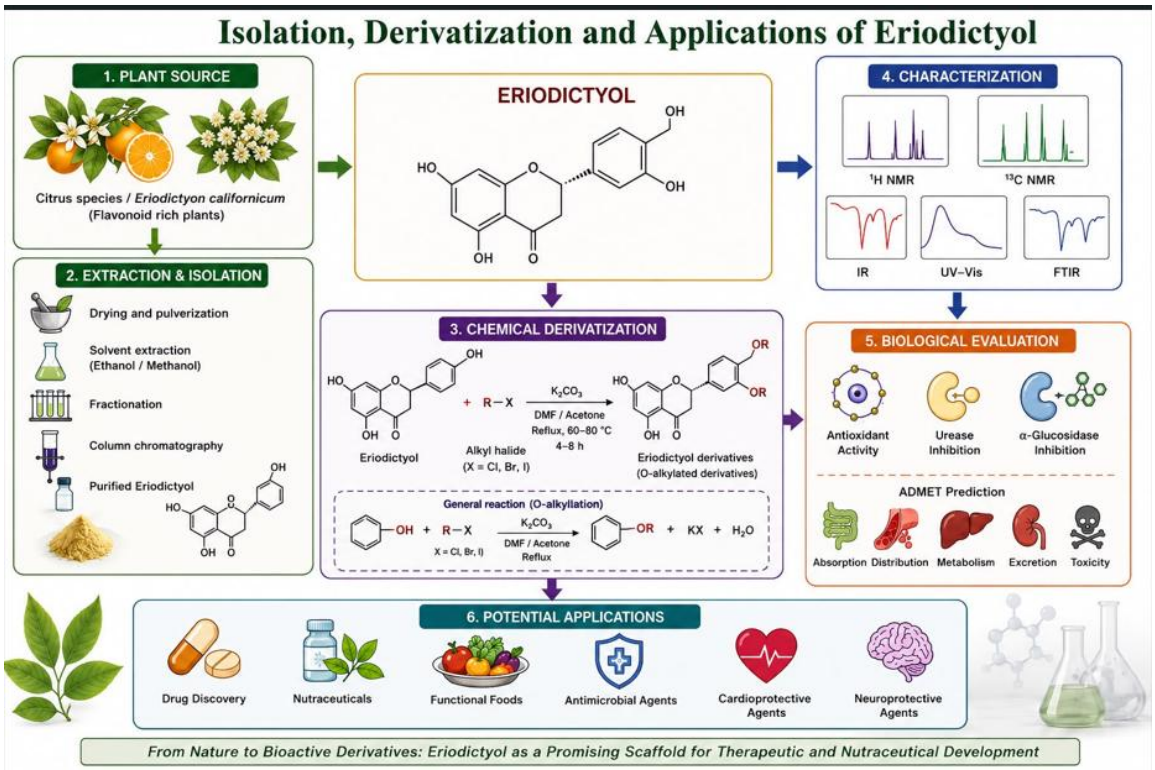
6	**Graphical Abstract**


Isolation, Derivatization and Applications of Eriodictyol
1. PLANT SOURCE
Citrus species / Eriodictyon californicum
(Flavonoid rich plants)
2. EXTRACTION & ISOLATION
Drying and pulverization
Solvent extraction
(Ethanol / Methanol)
Fractionation
Column chromatography
Purified Eriodictyol
ERIODICTYOL
3. CHEMICAL DERIVATIZATION
Eriodictyol
Alkyl halide
(X = Cl, Br, I)
K2CO3
DMF / Acetone
Reflux, 60–80 °C
4–8 h
Eriodictyol derivatives
(O-alkylated derivatives)
General reaction (O-alkylation)
X = Cl, Br, I
4. CHARACTERIZATION
1H NMR
13C NMR
IR
UV–Vis
FTIR
5. BIOLOGICAL EVALUATION
Antioxidant Activity
Urease Inhibition
α-Glucosidase Inhibition
ADMET Prediction
Absorption
Distribution
Metabolism
Excretion
Toxicity
6. POTENTIAL APPLICATIONS
Drug Discovery
Nutraceuticals
Functional Foods
Antimicrobial Agents
Cardioprotective Agents
Neuroprotective Agents
From Nature to Bioactive Derivatives: Eriodictyol as a Promising Scaffold for Therapeutic and Nutraceutical Development