INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study	:	Ph.D.

Thesis Title: **Isolation, characterization and pharmacological application of bioactive compound from leaves of *Alpinia nigra* (Gaertn.) B.L. Burtt**

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SHORT ABSTRACT

The present study is focused on investigating the potential uses of the herbaceous plant *Alpinia nigra* (Gaertn.) B.L. Burtt (Zingiberaceae). Traditionally this plant is used in folk remedies for curing gastritis and infectious diseases. The plant leaves are used as a food-flavoring agent by tribal people in Northeast (NE) India. However, the scientific community has not explored the plant leaf for its medicinal properties. Thus in the present study, the leaf extracts hexane (L-Hex), ethyl acetate (L-EtAc), and methanol (L-Met) were subjected to phytochemical analysis. The antibacterial, anti-biofilm, and anti-quorum sensing activities of the L-EtAc extract was determined by *in-vitro* analysis and was found to be potential. Further, the compound 3, 5-dihydroxy 4′,7-dimethoxy flavone (DHDM) was purified from L-EtAc, crystallized, and structural characterization was performed using multispectroscopic techniques including HRMS, FTIR, Raman, SC-XRD, 1-D NMR, and 2-D NMR. The cell viability assay showed no inhibition of DHDM at ≤200 µM concentration in THP-1 (human macrophage) and ≤80 µM in HaCaT (human keratinocyte) cell lines. Additionally, strong antioxidant properties and reduced ROS

generation suggested preventing oxidative damage and skin aging. Fluorescence quenching studies and molecular docking revealed strong binding of DHDM to tyrosinase leading to the conformational change. Further, the anti-tyrosinase activity of the isolated compound was observed at 42.5 µM (IC_{50}). Moreover, DHDM inhibited the expression of anti-inflammatory proteins like TNF-α and NF-κB. Furthermore, DHDM was evaluated as the antileishmanial agent, but the result was not significant. Therefore, a zinc derivative of DHDM was synthesized to enhance its anti-leishmanial effect. DHDM-Zn displayed considerable leishmanicidal activity (IC_{50} ~63±0.73 µM). Interestingly, significant growth inhibition in the promastigote cells was observed upon DHDM-Zn treatment. The flow cytometry analysis revealed promastigote's cell cycle arrest in the G1 phase. This may be because the compound might bind with DNA and inhibit the DNA replication. The binding nature of DHDM with nucleic acid (DNA) was investigated using UV–visible spectrophotometer, Isothermal calorimetry thermodynamic (ITC), and agarose gel-based assay. Thus exploring its potential as an alternative dye for ethidium bromide (EtBr). The study also confirmed the differential staining of live/dead cell for fluorescence microscopic study.