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Dammar bee honey as a natural anti-inflammatory agent: evidence from cell culture and biochemical assays

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Natural bioactive compounds with anti-inflammatory properties are increasingly explored as safer alternatives to synthetic drugs. This study evaluated the anti-inflammatory potential of dammar bee honey, a phytochemically rich but underexploited natural product, using a series of *in vitro* biochemical assays. The selected assays targeted key inflammatory pathways, including redox imbalance, enzymatic activity, and protein destabilization. Specifically, the inhibition of nitric oxide and activities of cyclooxygenase (COX), lipoxygenase (LOX), myeloperoxidase (MPO) and protease enzymes, along with protein denaturation, were assessed. Dammar bee honey significantly reduced nitric oxide production in stimulated cultures, indicating immunomodulatory potential. It effectively inhibited COX, LOX, and MPO activities, suggesting strong antioxidant and anti-inflammatory effects. Additionally, it stabilized proteins by reducing both denaturation and protease activity. Dammar bee honey demonstrated substantial inhibitory activity across all tested inflammatory markers, with effects closely approaching those of the standard anti-inflammatory drug diclofenac, particularly in COX inhibition and protein denaturation. These findings demonstrate the multi-targeted anti-inflammatory efficacy of dammar bee honey and support its potential as a natural therapeutic agent for modulating inflammatory responses.

Keywords: Bioactive compounds, Cell line study, Inflammation, Medicinal properties of honey, Protein denaturation, Therapeutic potential, *Trigona iridipennis*