



## ***FORMULATION AND EVALUATION OF in vitro ANTI- INFLAMMATORY AND ANTI-OXIDANT ACTIVITIES OF A PHYTO- GEL OF LEAF EXTRACT OF *Murraya koenigii****

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*Murraya koenigii* (Rutaceae) is a multi-potential medicinal plant that has been extensively used in traditional system of medicine in the treatment of oxidative stress associated chronic diseases including inflammation. Our previous studies showed that, the ethanol leaf extract (ELE) of *M. koenigii* has promising *in vitro* anti-oxidant and anti-inflammatory properties. The aim of the present study was to formulate a herbal based topical gel incorporating ELE of *M. koenigii* and to evaluate *in vitro* anti-oxidant and anti-inflammatory properties of the product. The air-dried, powdered leaves of *M. koenigii* was extracted with ethanol using cold extraction technique. Five gel formulations were prepared using different concentrations (0.2-1.0%, w/w) of carbopol and the formulation that showed good consistency and stability was selected to incorporate ELE of *M. koenigii*. A market sample of diclofenac gel was used as the reference standard. Physical properties such as pH, viscosity and spreadability were maintained in comparable with diclofenac gel. Anti-inflammatory and anti-oxidant activities of the phyto-gel was evaluated using arachidonate-5-lipoxygenase (A5-LOX) enzyme and xanthine oxidase (XO) enzyme inhibitory assays and DPPH free radical scavenging, ferric reducing anti-oxidant power (FRAP) and oxygen radical absorbance capacity (ORAC) assays respectively. Total Polyphenol Content (TPC) and Total Flavonoid Content (TFC) were also evaluated. The gel formulation having 0.8 % of carbopol showed good spreadability (0.83 cm), consistency, pH ( $6.86 \pm 0.01$ ), and viscosity (45879 cps, 10 rpm, spindle no.10) that are comparable to diclofenac gel (spreadability: 0.75 cm; viscosity: 49038 cps, 10 rpm, spindle no.7). The phyto-gel was dark green in colour with a characteristic aroma of fresh leaves of *M. koenigii*. Accelerated stability studies showed that there was no phase separation, no change in odour/colour, pH and spreadability. The phyto-gel showed marked, dose dependent dose dependent ( $62.5-1000 \mu\text{g/ml}$ ) A5-LOX enzyme inhibitory ( $\text{IC}_{50} : 219.27 \pm 7.66 \mu\text{g/mL}$ ) and XO enzyme inhibitory ( $32.94 \pm 2.46 \%$  at  $5 \text{ mg/mL}$ ) activities with pronounced DPPH free radical scavenging ( $\text{IC}_{50} : 392.67 \pm 4.10 \mu\text{g/ml}$ ), FRAP ( $1914.58 \pm 2.67 \text{ mg trolox equivalents (TE)/100 g of gel}$ ) and ORAC ( $3619.05 \pm 54.98 \text{ mg TE/100 g of gel}$ ) activities. TPC and TFC of the gel were found to be  $588.68 \pm 4.32 \text{ mg gallic acid equivalents (GAE)/100 g of phyto-gel}$  and  $437.69 \pm 11.52 \text{ mg Quercetin equivalents}$

(QE)/ 100 g of phyto-gel. All bio-activities were significant at  $p < 0.05$ . This study indicated that, the formulated phyto-gel may be claimed as a natural antiinflammatory/anti-oxidant product for dermal applications, which supports the traditional claims of *M. koenigii*.

**Keywords:** *Phytogel, Murraya koenigii, ethanol extract, anti-oxidant, anti-inflammatory*