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Phytochemical Composition and Antioxidant Potential of *Gracilaria verrucosa* and *Gracilaria multipartita***Peiris, L.D.C.^{1,3*}, Abeywardhana, B.A.S.D.¹, Tennakoon, S.H.³, Bandara, K.R.V.⁴,
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University of Sri Jayewardenepura, Nugegoda, Sri Lanka***dinithi@sci.sjp.ac.lk***Abstract**

Red algae play a significant role in free radical scavenging due to their abundance of phenolics and flavonoids, which contribute to cosmeceutical benefits. Such natural compounds support the development of bio-based products while aligning sustainable goals for environmental conservation. Also, there are very limited studies on Sri Lankan red algal species. In this study, two algal species, *Gracilaria verrucosa* (Trincomalee) and *Gracilaria multipartita* (Weligama, Matara), were collected with the permission from the Department of Wildlife Conservation (Permit No: W/3/2/113/2024) to evaluate their potential as natural antioxidants. Samples were shade-dried for three days, ground, and extracted using 80% methanol. The total phenolic content (TPC) was quantified using the Folin-Ciocalteu method with a gallic acid standard curve ($r^2=0.9905$). Antioxidant activity was determined using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay with each sample triplicated ($n=3$) and incubated for 30 minutes before absorbance was measured at 517 nm. The TPC of *G. verrucosa* and *G. multipartita* was found to be 4.94 ± 0.13 and 3.43 ± 0.23 mg GAE/g extract, respectively. *G. verrucosa* showed a stronger antioxidant response with $82.9\pm 0.9\%$ DPPH radical scavenging activity at 2 mg/mL compared to $61.5\pm 1.3\%$ in *G. multipartita*. Trolox was used as the positive control, which results in $93.44\pm 0.45\%$ scavenging activity. *G. verrucosa* demonstrated a significantly higher scavenging activity value among two algal extracts ($p<0.05$), reflecting higher antioxidant efficiency. The methanol extract of *G. verrucosa* exhibited higher phenolics than *G. multipartita* ($p<0.05$). The results revealed that both algae species contain notable levels of phenolics and bioactive constituents. This suggests that phenolic compounds may play a more dominant role in the radical scavenging capacity of these extracts. Beyond the bioactivity of these red algae, this research increases the significance of utilizing biological materials for value-enhanced, sustainable innovations.

Keywords: *Red algae, Gracilaria sp., Antioxidant activity, Total phenolic content, Sustainable biological materials*