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Antioxidative, Anticholinesterase and Anti-Neuroinflammatory Properties of Malaysian Brown and Green Seaweeds

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Abstract : Diminished antioxidant defense or increased production of reactive oxygen species in the biological system can result in oxidative stress which may lead to various neurodegenerative diseases including Alzheimer's disease (AD). Microglial activation also contributes to the progression of AD by producing several pro-inflammatory cytokines, nitric oxide (NO), and prostaglandin E2 (PGE2). Oxidative stress and inflammation have been reported to be possible pathophysiological mechanisms underlying AD. In addition, the cholinergic hypothesis postulates that memory impairment in patient with AD is also associated with the deficit of cholinergic function in the brain. Although a number of drugs have been approved for the treatment of AD, most of these synthetic drugs have diverse side effects and yield relatively modest benefits. Marine algae have great potential in pharmaceutical and biomedical applications as they are valuable sources of bioactive properties such as anti-coagulation, anti-microbial, anti-oxidative, anti-cancer and anti-inflammatory. Hence, this study aimed to provide an overview of the properties of Malaysian seaweeds (Padina australis, Sargassum polycystum and Caulerpa racemosa) in inhibiting oxidative stress, neuroinflammation and cholinesterase enzymes. All tested samples significantly exhibit potent DPPH and moderate Superoxide anion radical scavenging ability ($P<0.05$). Hexane and methanol extracts of S. polycystum exhibited the most potent radical scavenging ability with IC50 values of 0.1572 ± 0.004 mg/ml and 0.8493 ± 0.02 for DPPH and ABTS assays, respectively. Hexane extract of C. racemosa gave the strongest superoxide radical inhibitory effect (IC50 of 0.3862± 0.01 mg/ml). Most seaweed extracts significantly inhibited the production of cytokine (IL-6, IL-1 β, TNFα) and NO in a concentration-dependent manner without causing significant cytotoxicity to the lipopolysaccharide (LPS)-stimulated microglia cells ($P<0.05$). All extracts suppressed cytokine and NO level by more than 80% at the concentration of 0.4mg/ml. In addition, C. racemosa and S. polycystum also showed anti-acetylcholinesterase activities with the IC50 values ranging from 0.086-0.115 mg/ml. Moreover, C. racemosa and P. australis were also found to be active against butyrylcholinesterase with IC50 values ranging from 0.118-0.287 mg/ml.

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