

Abiotic stresses induce total phenolic, total flavonoid and antioxidant properties in Malaysian indigenous microalgae and cyanobacterium

ABSTRACT

Aims: The use of microalgae as source of natural antioxidants is under explored in Malaysia. Previous studies have shown that microalgae contain minerals, polysaccharides, amino derivatives, carotenoids and phenolic compounds. This study aimed to determine total phenolic and flavonoid compounds and antioxidant activity when microalgae (*Nannochloropsis oculata* and *Tetraselmis* sp.) and cyanobacterium (*Anabaena* sp.) were subjected to abiotic stresses.

Methodology and results: Treatment of sodium chloride (NaCl), sodium hypochlorite (NaOCl) and copper (Cu²⁺) were given when the cultures reached the exponential phase of growth and were collected at three different time points. Nontreated cultures were used as controls. Total phenolic and flavonoid contents were determined using Folin-Ciocalteu phenol reagent and aluminium chloride colorimetric assays. Antioxidant activities were measured using 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging activity assay. *Tetraselmis* sp. exhibited the highest phenolic content under copper stress ($10.35 \pm 0.33 \mu\text{g GAE/mg extract}$). *Nannochloropsis oculata* showed the highest total flavonoid content under copper stress ($33.85 \pm 3.16 \mu\text{g QE/mg extract}$). *Anabaena* sp. showed the highest radical scavenging activity under NaOCl stress ($96.42 \pm 0.26\%$).

Conclusion, significance and impact of study: This study showed that total phenolic, flavonoid and antioxidant activities in treated cultures were high compared to non-treated cultures. These microorganisms could be utilized as a source of useful bioactive compounds while exploiting its abundance.

Keyword: Microalgae; Cyanobacteria; Antioxidant; Stress