Bioavailability of Antioxidants, Minerals, and Heavy Metals in Two Edible Seaweed Species: *Kappaphycus alvarezii* and *Caulerpa lentillifera*

Gangani W.G.R.., Jayawardana B.C.[*], Liyanage R. [1], Sewwandi S.M.[1], and Weththasinghe P.
Department of Animal Science,
Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

This study investigated the bioavailability of antioxidants, minerals, and heavy metals in two selected edible seaweed species in Sri Lanka: *Kappaphycus alvarezii* and *Caulerpa lentillifera*. The collected seaweed samples were dried at 55 °C, powdered and subjected to *in vitro* digestion using synthetic gastrointestinal enzymes. A dialysis membrane of 12 kDa molecular cut-off was used to simulate intestinal absorption. Total Phenolic Content (TPC) and Total Flavonoid Content (TFC) in seaweed powder and the bioavailable fraction of digested seaweed were measured using the Folin-Ciocalteu method and Aluminum chloride colorimetric assay, respectively. The antioxidant activity was determined using 2,2-Diphenyl-1-picryl-hyrazyl-hydrate (DPPH) radical scavenging activity, 2,2′-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) radical scavenging activity and Ferric Reducing Antioxidant Power (FRAP) assays. The mineral (Fe, K, Mg, Al, Zn) and heavy metal (Cd, Cr, Mn, Co, Ni, Mo, V) contents of seaweed powder and bioavailable fraction were measured by Inductively Coupled Plasma – Optical Emission Spectroscopy (ICP-OES). The TPC of the bioavailable fractions of *K. alvarezii* and *C. lentillifera* were 1.47±0.01 and 1.76±0.04 mg GAE/g, respectively. These values were significantly ($P<0.05$) higher than the TPC in powdered seaweeds (0.76±04 mg GAE/g DW and 1.06±04 mg GAE/g DW respectively) showing that the simulated digestion had improved the polyphenol bioavailability in the studied seaweeds. The TFC in both seaweed powder and bioavailable fraction were not within the detectable limit. Compared to powdered seaweeds, bioavailable fractions showed a significantly ($P<0.05$) higher antioxidant capacity for ABTS assay and a significantly ($P<0.05$) lower antioxidant capacity for DPPH assay. For FRAP assay, *C. lentillifera* showed significantly ($P<0.05$) higher antioxidant capacity than powdered seaweed. Both mineral and heavy metal bioavailability were significantly ($P<0.05$) higher in *K. alvarezii* than in *C. lentillifera.* Results revealed that digestion significantly affects polyphenolic and mineral bioavailability. These seaweeds have the potential to address micronutrient malnutrition and oxidative stress-related diseases.

Keywords: Antioxidants, Bioavailability, Heavy metals, *In vitro* digestion, Seaweeds

[1]Laboratory of Nutritional Biochemistry, National Institute of Fundamental Studies, Kandy, Sri Lanka
[*]baranaj@agri.pdn.ac.lk