Rheological properties of agar and carrageenan from Ghanaian red seaweeds

Red seaweeds contain unique galactose-rich hydrocolloids, carrageenans and agar, which find use as gelling agents in high value applications. This study examined the chemical and rheological properties of hydrocolloids from selected wild red seaweed species collected in Ghana: Hypnea musciformis and Cryptonemia crenulata, expected to hold carrageenan, contained 21–26\% by weight of galactose. A commercial Kappaphycus alvarezi carrageenan sample had 30\% galactose residues by weight. Hydropuntia dentata, expected to contain agar, contained 15\% by weight of galactose-monomers. Fourier transform infrared spectroscopy (FTIR) analysis on the hydrocolloids extracted from H. musciformis (and K. alvarezi) indicated κ-carrageenan, C. crenulata hydrocolloids were mainly ι-carrageenan, and the H. dentata hydrocolloids were agar. Gelling temperatures ranged from 32 to 36 °C for the κ-carrageenan hydrocolloid samples. The ι-carrageenan and agar samples had gelling temperatures of 70–74 °C and 38–52 °C, respectively. Gel strengths, G' at 25 °C, of carrageenan samples extracted via alkali-treatment were 4000–6500 Pa. The agar gel strength was 287 Pa. The rheological properties of the H. musciformis κ-carrageenans were comparable with κ-carrageenan from K. alvarezi, whereas the H. dentata agar properties were different from those of a commercial agar sample. This work shows that certain red seaweed species in Ghana contain hydrocolloids with desirable properties for high value applications.