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# Molecular Origin of the Rheological Characteristics of ι-Carrageenan Isolated from Togekirinsai (*Eucheuma serra*)

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The rheological properties of ι-carrageenan isolated from Togekirinsai (*Eucheuma serra*) were measured with a rheogoniometer. The flow curves of a Ca-salt of ι-carrageenan solution showed plastic behavior and the yield value was estimated to be 0.4, 1.7 and 7.7 Pa at 0.1, 0.2 and 0.3% (w/v) concentration, respectively. The dynamic modulus of Ca-salt of ι-carrageenan increased with increase in concentration and gelation occurred at a concentration of 0.3% (w/v) at room temperature. The Ca-salt showed larger values than did of Na- and K-salts of ι-carrageenan in dynamic viscoelasticity. The Na- and K-salts of ι-carrageenan had very large values in the presence of $CaCl_2$ (6.8 mM) in dynamic modulus which maintained a constant value as the temperature increased to 40°C. A transition temperature, at which dynamic modulus decreased rapidly, was observed at 40° C. The Ca-salt of ι-carrageenan decreased with the addition of urea (4.0 M). The gel formation of the ι-carrageenan isolated from Togekirinsai might be essentially attributed to intra- and intermolecular associations, contributed by sulfate groups of adjacent D-galactose and 3,6-anhydro-D-galactose residues through $Ca^2$ bridges with ionic bonding and attractive electrostatic forces within and between molecules.

**Keywords:** Togekirinsai, *Eucheuma serra*, ι-carrageenan, Ca-bridges, ionic bonding, molecular origin

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