

The Influence of Polysaccharides on the Glass Transition in Frozen Sucrose Solutions and Ice Cream

H. D. Goff¹, K. B. Caldwell¹, D. W. Stanley¹, and T. J. Maurice²

¹ Department of Food Science, University of Guelph, Guelph, ON, Canada N1G 2W1

² Ault Foods Ltd. London, ON, Canada N6B 1N8

The objective of this study was to describe further the mechanism by which polysaccharide stabilizers contribute to stability of frozen dairy desserts. The influence of stabilizers on the thermal properties and viscosity of carbohydrate solutions at subzero temperatures, on the thermal properties of ice cream mix, and on ice crystallization and growth in ice cream were investigated. Polysaccharide stabilizers did not influence the thermal properties of sucrose solutions as measured by differential scanning calorimetry. Stabilizers provided resistance to thermal deformation and increased subzero viscosity above the glass transition temperature but did not influence the experimental glass transition temperature of the solutions or ice cream mix as determined by thermomechanical analysis. The effect of stabilizers on ice crystals in ice cream was demonstrated by low temperature scanning electron microscopy, which showed that the initial ice crystal size and the rate of growth after 24 wk of storage at abusive temperatures were smaller in stabilized ice creams than in unstabilized ice creams. The influence of stabilizers on ice crystal size in ice cream above its glass transition temperature was postulated to be a function of the kinetic properties of the freeze-concentrated, viscoelastic liquid surrounding the ice crystals.

Key Words: glass transition • ice cream • stabilizers • thermomechanical analysis

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