Inhibiting Ice Recrystallization by Corn Cob Hemicelluloses

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Currently, several polysaccharides, such as guar gum and locust bean gum (LBG), are used as stabilizers for ice recrystallization inhibition in ice cream. However, gums have seasonal supplies and geographical limitations, and the price of LBG reaches record highs recently. Therefore, there is an urgent need to search for suitable gum alternatives that are easily available. Cellulosic materials are excellent candidates due to their abundance and low cost.

In this research, we have found that hemicelluloses extracted from corn cobs demonstrated significant ice recrystallization inhibition (IRI) activity. Hemicellulose is a heterogeneous biopolymer that co-exists with cellulose and lignin providing structural support to plants. We have extracted hemicelluloses by a potassium hydroxide solubilization of holocellulose and ethanol precipitation of hemicellulose. Approximately 13.66% of hemicellulose is able to be extracted from dried corn cobs. The IRI activity is determined in 25% sucrose by a sandwich assay. Ice crystal sizes were measured at various time intervals leading up to a total 7-day incubation period. When compared to cellulose nanocrystals (CNCs), a cellulosic material that has good IRI activity. Ice crystals in the hemicellulose samples were on average 18.15% smaller than those of the CNC samples.