

Title:

Application of Plant-derived Antifreeze Protein for Food Preservation under Frozen Condition

Authors:

Naoki Arai¹, Hideaki Kegasa¹, Shinichi Yokota¹, Jun Tomono¹ and Hidehisa Kawahara²

Affiliations:

1 Frontier Biochemical and Medical Research Laboratories, Corporate Research and Development Division, Kaneka Corporation

2 Department of Life Science and Biotechnology, Faculty of Chemistry, Materials and Bioengineering, Kansai University

Abstract:

Antifreeze proteins (AFPs) control ice crystal growth and prevent recrystallization, therefore having a potential in the use of quality preservation of frozen foods. The majority of AFPs are considered to attach to the ice crystal surface and change ice crystal morphology, therefore showing thermal hysteresis (TH) activity and recrystallization inhibiting (RI) activity. We have recently developed natural AFP material from Japanese radish sprout, which has a unique characteristic in that it doesn't change ice crystal morphology and only shows potent RI activity. In the present study, we investigated the beneficial effects of the AFP material from Japanese radish sprout for food preservation under frozen condition. We prepared various processed foodstuffs (wheat noodle, white rice and steamed egg custard etc.) containing AFP, preserved them under frozen condition, and then compared the appearance and texture with control (not containing AFP). In frozen wheat noodle, we observed the inhibitory effect of AFP on the development of discolored areas on the surface after repetitive freeze/thaw experiment, and elastic texture was maintained when cooked in boiling water. The same effect was observed in frozen white rice, and when thawed at room temperature, it attained the smooth and sticky texture. Furthermore, addition of AFP on the steamed egg custard prevented it to be sponge-like after freeze/thaw, resulted in the maintainance of smooth texture. The unique effects were also obtained in other processed foodstuffs. The quality preservation of frozen food by AFPs is a possible measure to reduce food waste, and our results indicated that AFPs have a beneficial advantage in frozen food industry.