ABSTRACT

As a cold-variation mechanism, antifreeze proteins/peptides (AFPs) or antifreeze glycopeptides (AFGPs) are produced by various organisms for protection against freezing injury. This study delves into the unique properties of AFPs and AFGPs and their impact on the nonequilibrium freezing point, specifically exploring the phenomenon of thermal hysteresis (TH) as a metric for the specific activity of these proteins. TH measurements were conducted using a nanoliter osmometer to elucidate the concentration-exposure time-activity relationship. Antifreeze Proteins (AF(G)Ps) inhibit ice growth via an adsorption-inhibition mechanism that assumes irreversible binding of AFGPs to embryonic ice crystals and the inhibition of further growth. Using fluorescence microscopy to measure the adsorption rate of the AFGP, this study reveals an experimental link between TH activity and adsorption rate.

CONCLUSIONS & RECOMMENDATIONS

Through the corresponding function diagram, it can be found that increasing the concentration and prolonging the exposure time can help increase the activity of ice-binding proteins.

The scope of the study will be expanded in future studies by measuring other types of AFP samples and extending the concentration-exposure time-activity relationship analysis to mixed AFP samples.

In the process of measuring the adsorption rate, it is necessary to strictly control the influence of irrelevant factors, such as background noise and accurate focus.