Effects of water state upon freshness change of raw tuna meat during storage

Authors: Tri Winarni Agustini,[b] Toru Suzuki,[a] Tomoaki Hagiwara,[a] *Rikuo Takai,[a]

[a]Affiliation: Department of Food Science and Technology, Tokyo University of Fisheries

[b]Affiliation: Department of Fisheries, Fisheries and Marine Science Faculty, Diponegoro University

Corresponding author: Rikuo Takai

Contact address: 4-5-7 Konan, Minato-ku, Tokyo 108-8477, Japan

Fax: +81-3-5463-0585, Tel: +81-3-5463-0620, E-mail: takai@tokyo-u-fish.ac.jp

Frozen storage has been widely utilized for preserving quality of raw fish meat. Generally, by decreasing temperature, the physicochemical changes of water state occur, such as formation of ice crystals, freeze concentration, and glass transition of the maximally freeze-concentrated solute matrix. It is expected that these changes affects stability of fish meat quality during storage. In this study, firstly the freshness change of raw fish meat was investigated in a storage temperature range of 20°C to -84°C. Secondly, physicochemical characterization of water in the sample was performed using Differential Scanning Calorimetry (DSC). And finally, comparing both experimental results, effects of water state upon the freshness change of fish meat was examined. Fresh yellowfin tuna was used as a fish meat sample. The freshness was estimated by *K* value; a biochemical index based on nucleotide degradation. The plot of logarithm of (100-*K* value) against storage time yielded a straight line, which indicated an apparent first-order reaction for all temperature storage. The temperature dependence of this reaction was analyzed by an Arrenius's plot, resulting in two breaking points. The first breaking point was close to the freezing point of the sample, suggesting that this breaking point was due to the freezing effect. The second occurred was at -10°C. The reaction rate change steeply declined at the temperature rage of -70°C to -84°C and was thought to be related to glass transition which may occur in the fresh sample. This fact suggested that storage below glass transition temperature has a potential to extend shelf life of raw fish meat remarkably.

Reference

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