QUALITY EVALUATION AND NEW APPROACH TO FRESHNESS ASSESSMENT OF SOME MARINE FISHES

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Tri Winarni Agustini

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ABSTRACT

Fish and fisheries products play an important role as food supply in Japan. Total production of fish itself resulted from both marine and inland fisheries and also aquaculture has decreased by 1.8 million tons in 1994 to 1997. In fact, the demand of such product is increasing by year. The evaluation of fish freshness has been an important issue in the fisheries industries and scientific field for long time since a big trading of fish has begun. A tremendous number of researches had been conducted relating to fish freshness that were intended to establish the evaluation system, i.e. what kind of fish characteristics necessarily to be selected and how to measure it. Moreover, they are mainly focused on the relation with safety from microbiological point of view and regarding storage method. However, the background of most studies seemed to be under consideration for social and technical system of that age. For example, in 30 to 40 years ago, when many studies were conducted intensively, consumer's demand for fish quality was not so high, even if there was potentiality; refrigerator as home electronic had not yet been commonly used in average family in Japan. Transportation system was showing similar condition, cold chain system had just been in circulation at that time. However, after that, there were many changes in economic, technology and also human mind in Japan. Each changing corresponding to fish evaluation system has markedly developed. Nowadays, recent development in commercial distribution of fish concerning its transportation system has become apparent. Moreover, live transportation of fish is becoming popular and favorable for fish supplying. All these are leading to better handling and preserving the fish and consequently result in good quality that met consumer's need or expect. However, to date, there is very less or no scientific report regarding to the assessment of quality of such fish product.

Chapter 2 was dealing with the evaluation of initial freshness (K value) of some marine fishes supplied under recent transportation system. The information obtained from the study will be useful for people who involved and interested in marketing of such product. From the result of initial K value obtained in the samples of cultured southern bluefin tuna (chilled state), cultured yellowtail, cultured red sea bream and cultured Japanese flounder (all taken from live state), it was concluded that the freshness was fairly good and comparable to the quality of related fishes killed immediately after being caught (for live fishes) and much better to the frozen one (for

southern bluefin tuna). The difference part of fish body was also observed for its effect on initial K value of the fish. Tail part gave highest initial K value compared to the other parts of fish body (dorsal and abdomen). It was thought that activities of the muscle prior to death of fish would affect on its ATP degradation rate, which in turn, reflect on its initial K value.

Good practice in modern fisheries industries is that applying of a popular technology of deep-freezing below temperature of –55°C for preserving the fish for storage at long period. Chapter 3 described the importance of very low temperature storage for preserving fish such as tuna. In order to have a better overview of temperature-dependent on chemical reaction, storage temperature ranging from 20°C to –84°C was applied during study. Chemical reaction involving degradation of ATP was investigated by using K value. The K value change during storage was found to be temperature-dependent reaction and from the Arrhenius plot, it was observed there were three break points occurred. The first was occurred around –3°C that was due to the occurrence of water phase change in the fish sample. The second was occurred around –10°C and the third was occurred at –70°C that was thought that glass transition was responsible for this phenomenon. This phenomenon has brought about a new kinetic parameter that was firstly found from the study of fish deterioration at very low temperature. Moreover, study on glass transition of fish was considered to be not related to its freshness changing during storage. Using of very low temperature (lower than –70°C) is recommended for tuna during storage for long period.

Owing to the importance of freshness in determining the product quality of fish, many researches have been conducted for its analysis. This resulted in introducing tremendous number of methods for analyzing fish freshness. For its application, however, simplicity, rapid, reliable and economically low price, will be of concern by people working in fisheries industries. In Chapter 4, the use of oxidation-reduction potential (ORP) for assessing fish freshness was introduced and evaluated. The ORP measurement of some marine fishes showed changing during storage. As fish deterioration proceeded, the ORP showed significant respond and that was observed for both live and killed immediately and frozen thawed fishes. The relation of measured ORP and K value was also evaluated where initially ORP and K value increased as fish deterioration proceeded, but after certain period, the ORP will turn to decreased. The period, in which the ORP showing increase up to the maximum ORP is indicating first stage of deterioration, conversely decreasing in the ORP afterward is indicating the later stage of deterioration. Considering the aforementioned results, the ORP enable for evaluating fish freshness and due to its simple, reliable and relatively low price, this method may applicable for use in fish market or fisheries industry.