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K. Value, an Index for Estimating Fish Freshness

Objective chemical indices such as volatile base nitrogen (VB-N), trimethyl amine nitrogen (TMA-N), ammonia (NH_3) or dimethyl amine nitrogen (DMA-N), in the case of gadoids, have been proposed to estimate the quality of fish. These compounds are produced in fish muscle by spoilage bacteria. However, these indices are only of use in the later stages of spoilage. In earlier stages of spoilage nucleotide and/or hypoxanthine (Hx) concentrations has been proposed as useful indices of fish quality. Since the nucleotide pool varies with species and also that the rate of formation of inosine and hypoxanthine differs among species, the limitation of Hx as an index of quality was pointed out (Dyer et al 1966, Ehira and Uchiyama (1973). Ratios of ATP breakdown products to total nucleotides have been shown to correlate with freshness in many fish. Thus, K-value as an index for estimating fish freshness was proposed by Saito et al (1959) who defined it as :

$$\text{K Value (\%)} = \frac{(HxR + Hx)}{ATP + ADP + AMP + IMP + HxR + Hx} \times 100$$

where

HxR = Irosine, Hx = Hypoxanthine
ATP = adenosine 5′ — triphosphate
ADP = adenosine 5′ — diphosphate
AMP = adenosine 5′ — monophosphate and
IMP = inosine 5′ — monophosphate

The K value in fish muscle increases constantly with time. Ehira (1976) remarked that K-value was one of the most appropriate indicators of freshness. In Japan, the K values of fish are measured and shown on the labels for the benefit of consumers.

In industry circles, the freshness of fish is usually estimated using the senses and experience. The relationship between

freshness of fish and K-value was studied on 104 fish samples from commercial sources by statistically examining measured values of three parameters viz. TVB-N, TMA-N and K-value, only K-value showed a correct index of quality (Ehira & Uchiyama 1986). K value gave almost same result as commercial sensory evaluation.

Based on an extensive study Ehira and Uchiyama (1986) established three categories of fish. Those that form inosine (tuna, marlin, mackerel, horse mackerel, pacific cod etc.); those that form hypoxanthine (flat fish, grouper, plaice etc.); and those that are intermediate (halibut, salmon, eel etc.) Striking differences among different species in rate of change of K-value was well in aggrement with the rate of freshness decline in these species. The K-value of Pacific cod and Alaska pollack increased to 60 per cent within two days of iced storage whereas those of the red seabream reached only 20 per cent after 12 days and the black seabream 8 days of ced storage.

The estimation of K-value in a number of fish species clearly indicated that it can be used as a means of evaluating the real freshness of fish. The nucleotide degradation in rainbow trout and a number of Indian species like Etroplus, mullet, silver pomfret rainbow sardine, jew fish, ribbon fish squid and a few species of prawns has been studied by the author. In general, fish species remained in acceptable quality upto 12 to 16 days in ice, when K-value reached 50 - 60 per cent. In squid and shrimps K-value exceeded 50 per cent during 8-10 days in ice and thereafter lost their freshness beyond acceptability. Sensory characteristics of the fish was found to be well correlated with K-value.

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