

Freshness assessment of European hake (*Merluccius merluccius*) through the evaluation of eye chromatic and morphological characteristics

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The quality of fish products is indispensably linked to the freshness of the raw material. Its evaluation can be performed using chemical, sensory and physical methods. Nowadays the most commonly used method is the sensory inspection; alternative sensory methods such as the Quality Index Method (QIM), based on the significant sensory parameters of one specific species, have been recently suggested. Considering that most of the sensory parameters are based on visual impression, the set-up of an objective method using computer vision techniques is very promising. Previous experiments conducted on this application showed that eye colour and shape are the most interesting parameters to be monitored in order to measure / predict fish freshness.

The objective of this research was to characterize the changes in eye chromatic and morphological characteristics of European hake (*Merluccius merluccius*) during 13 days of storage on ice, using a tailored computer vision technique and a 3D scanner.

Results obtained by multivariate statistical analysis of the colour spectra of eye images and by the eye concavity index using 3D scanner permitted to estimate fish unacceptability after 7 days of storage, in agreement with results obtained by QIM sensory analysis.

Moreover, H1-NMR was used to evaluate the production of total volatile bases (TVB) and trimethylamine (TMA) and the metabolic profile of the samples, confirming a good correlation with eye chromatic and morphological features.

This preliminary study showed the high potentiality of the developed method as a non-destructive technique for raw fish freshness characterization / prediction, being a promising approach in order to create a robust portable instrument for the evaluation of fish freshness in real transport and marketing conditions.