Freshness is one of the most desirable features and important quality markers of fish not only due to its delicious taste, but because the absence of freshness can have serious consequences on both enjoyment and health. Fish is highly vulnerable to spoilage, which not only results in undesirable taste, but can also interfere with safety by exposing consumers to harmful parasites, bacteria, and chemicals. As such, the fish industry goes to great lengths to preserve freshness throughout processing via tightly controlled handling, storage, and transportation practices along with multiple quality assessments. While historically fish quality has primarily been assessed via sensory methods, these are often time-consuming, expensive, and difficult to standardize.[1] Technological advances are increasing the availability of non-sensory evaluation methods in the determination of fish quality, providing more rapid, economical, and impartial results.

Using Spectral Analysis to Assess Fish Quality

Spectral analysis offers one of the most flexible, versatile, and reliable methods of measuring the quality of both fresh and chilled fish by identifying and quantifying specific physical and chemical processes and contaminants that indicate spoilage. Spectrophotometric instrumentation is currently being used to monitor a number of vital quality parameters, including oxidative rancidity, dimethylamine, ammonia, hypoxanthine, thiobarbituric acid, and formaldehyde levels. While some spectrophotometry-based methods have been optimized for peak performance, others are still developing as the demand for more refined non-sensory assessment protocols grows. A prime example of this is the recent development of a an improved trimethylamine determination methodology.

Trimethylamine (TMA)

Trimethylamine (TMA) is a volatile amine that develops due to the emergence of spoilage bacteria and is responsible for producing the telltale fishy smell of spoiled seafood. For some types of fish, TMA levels serve as an important indicator of edibility, freshness, and overall quality. Although TMA may indicate bacterially compromised fish, it not necessarily correlate to total bacterial quantity; rather, it is thought to signal the presence of specific bacterial types associated with spoilage, which may cause significant deterioration even in small numbers. Spectrophotometry-based TMA analysis is employed for determination of fish quality in a number of species as a faster and more reliable alternative to bacterial count analysis.

A New Method of TMA Determination

Despite its advantages over bacterial enumeration, AOAC Official Method 971.14, the most popular method of TMA determination currently in use, has several significant shortcomings. Not only does it suffer from limited efficacy due to its inability to detect early stages of spoilage, but it "involves several time consuming-steps as well as the use of large amounts of hazardous reagents" and has been shown to overestimate TMA levels.[2] Now, researchers have developed a new colorimetric method for TMA analysis using microvolume UV-Vis spectrophotometry in combination with headspace-single-drop microextraction. As noted in *Food Chemistry*, "This method is well suited to determination of TMA-N in different species of frozen and fresh fish samples from markets and to study the evolution of TMA-N concentration in farmed turbot at the earliest stages of deterioration." More specifically, it offers increased sensitivity, stability, simplicity, and rapidity to allow for earlier spoilage detection across a larger number of species as well as reduced sample volume to increase flexibility. By implementing this new way of determining TMA values, the fish industry could enjoy a new level of quality assurance while realizing real cost savings.

Full article with photos available here:

https://www.hunterlab.com/blog/color-food-industry/spectral-analysis-offers-new-possibilities-for-fish-quality-assessment-and-detection-of-tma/