

# Fish Quality Assessment

Quality is the degree of acceptability by consumer.

Most often “quality” refers to the aesthetic appearance and freshness or degree of spoilage which the fish has undergone. It may also involve safety aspects such as being free from harmful bacteria, parasites or chemicals.

Methods to assess the quality of fish include:

1. Sensory methods
2. Biochemical and chemical methods
3. Physical methods
4. Microbiological methods

## Sensory methods

Sensory evaluation is defined as the scientific discipline used to evoke, measure, analyze and interpret reactions to characteristics of food as perceived through the senses of sight, smell, taste, touch and hearing.

Most sensory characteristics can only be measured by humans. However, advances are being made in the development of instruments that can measure individual quality changes e.g. **Rheometer** for measuring texture, **artificial nose** to evaluate odor profile.

In sensory analysis, appearance, odor, flavor and texture are evaluated using the human senses. Scientifically, the process can be divided into three steps. Detection of a stimulus by the human sense organs; evaluation and interpretation by a mental process; and then the response of the assessor to the stimuli.

Sensory methods are of two types: Objectives and subjectives

**Objective assessment** is in a form of questioning which has a single correct answer.

**Subjective assessment** is a form of questioning which may have more than one correct answer (or more than one way of expressing the correct answer).

Objective assessment can be discriminative or descriptive.

**Discriminative testing** is used to determine if the difference exists between samples (triangle test, ranking test).

**Descriptive testing** is used to determine the nature and intensity of the difference (Profiling).

**Triangle test:** The assessors receive three coded samples and are told that two of the samples are identical and one is different, and are asked to identify the odd sample.

**Ranking:** In ranking, a number of samples are presented to the panel. Their task is to arrange them in order according to specified characteristics, e.g., downward concentration of salt.

**Profiling:** Profiling is used for assessment of a single attribute e.g. for taste, parameters include fresh fish, oily, greasy, fruity, metallic, sweet etc.

### **Quality index method**

Quality index method (QIM) is a seafood freshness quality control system what was developed by European Fisheries Research Institute.

QIM is using a practical rating system, in which the fish is inspected and the fitting demerit point is recorded. The scores for all the characteristics are then summed to give an overall sensory score, the so call quality index. QIM gives scores of zero for very fresh fish while increasingly larger totals result as fish deteriorate (maximum 20).

Table: Quality assessment scheme used to identify the quality index demerit score

Quality parameter	Character	Score (ice/seawater)
General appearance	Skin	0 Bright, shining 1 Bright 2 Dull
	Bloodspot on gill cover	0 None 1 Small, 10-30% 2 Big, 30-50% 3 Very big, 50-100%
	Stiffness	0 Stiff, in <i>rigor mortis</i> 1 Elastic 2 Firm 3 Soft
	Belly	0 Firm 1 Soft 2 Belly burst
	Smell	0 Fresh, seaweed/metallic 1 Neutral 2 Musty/sour 3 Stale meat/rancid
Eyes	Clarity	0 Clear 1 Cloudy

	Shape	0 Normal 1 Plain 2 Sunken
Gills	Colour	0 Characteristic, red 1 Faded, discoloured
	Smell	0 Fresh, seaweed/metallic 1 Neutral 2 Sweaty/slightly rancid 3 Sour stink/stale, rancid
Sum of scores		(min. 0 and max. 20)

### Biochemical and chemical methods

These include total volatile basic amines, biogenic amines and oxidative rancidity.

#### Total volatile basic amines

Total volatile basic amines (TVB) is one of the most widely used measurements of seafood quality. It is a general term which includes the measurement of

- **Trimethylamine** (produced by spoilage bacteria)
- **Dimethylamine** (produced by autolytic enzymes)
- **Ammonia** (produced by the deamination of amino-acids and nucleotide catabolites) and
- Other **volatile basic nitrogenous compounds** associated with seafood spoilage

Total volatile basic amines are measured by **Conway method**.

#### Biogenic amines

Fish muscle has the ability to support the bacterial formation of a wide variety of amine compounds which result from the direct decarboxylation of amino acids. Histamine, cadaverine and tyramine are produced from the decarboxylation of histidine, lysine and tyrosine, respectively. Histamine has received most of the attention since it has been associated with incidents of scombroid poisoning in conjunction with the ingestion of tuna, mackerel, mahi-mahi.

Some of the methods for biogenic amine analysis include high pressure liquid chromatography, gas chromatography and rapid enzymatic method for histamine using a microplate reader.

#### Oxidative rancidity

The highly unsaturated fatty acids found in fish lipids are very susceptible to oxidation. The primary oxidation products are the lipid hydroperoxides. These compounds can be detected by chemical methods using spectrophotometer.

## **Physical methods**

### **Electrical properties**

Electrical properties of skin and tissue change after death and expected to provide a means of measuring post mortem changes or degree of spoilage.

GR Torrymeter is the instrument used to measure electrical properties. However, this instrument is not able to measure quality or freshness of a single fish, although it may find application in grading batches of fish.

### **pH**

Knowledge about the pH of fish meat may give valuable information about its condition. Measurements are carried out with a pH-meter by placing the electrodes either directly into the flesh or into a suspension of fish flesh in distilled water.

### **Measuring texture**

Texture is an extremely important property of fish muscle, whether raw or cooked. Fish muscle may become tough as a result of frozen storage or soft and mushy as a result of autolytic degradation. Texture may be monitored organoleptically but can be measured by instrument penetrometer.

## **Microbiological methods**

### **Total counts**

This parameter is synonymous with Total Aerobic Count (TAC) and Standard Plant Count (SPC). The total count represents the total number of bacteria that are capable of forming visible colonies on a culture media at a given temperature. Common plate count agar is the substrate used for determination of total count.

### **Direct epifluorescence filter technique (DEFT)**

Microscopic examination of foods is a rapid way of estimating bacterial levels. In this method, cells are stained with acridine orange and then detected by fluorescence microscope. One cell per field of vision equals approximately  $5 \cdot 10^5$  cfu/ml.

### **Spoilage bacteria**

It is recognized that certain bacteria are the main cause of spoilage in fish. Different peptone-rich substrates containing ferric citrate have been used for detection of H<sub>2</sub>S producing bacteria.