

2.1 VARIOUS QUALITY ATTRIBUTES OF FOOD, INSTRUMENTAL, CHEMICAL AND MICROBIAL QUALITY CONTROL

1. Physical Attributes:

Texture: Instrumental methods like texture analyzers measure parameters such as hardness, chewiness, springiness, and adhesiveness of food products.

Color: Colorimeters and spectrophotometers quantify color attributes such as hue, saturation, and lightness in foods.

Size and Shape: Image analysis systems measure dimensions and geometrical characteristics of food items.

2. Chemical Composition:

Proximate Analysis: Determines the content of moisture, protein, fat, ash, and carbohydrates using methods such as gravimetry, titration, and spectrophotometry.

Vitamins and Minerals: Instrumental techniques like chromatography (e.g., HPLC) and atomic absorption spectroscopy (AAS) quantify vitamins (e.g., vitamin C) and minerals (e.g., iron, calcium).

Fatty Acid Composition: Gas chromatography (GC) analyzes the profile of fatty acids in oils and fats.

3. Nutritional Content:

Caloric Content: Bomb calorimetry measures the energy content of food by combusting it in a controlled environment.

Antioxidant Activity: Methods such as spectrophotometry or electrochemical assays quantify antioxidant capacity in foods.

4. Microbiological Quality:

Microbial Load: Automated systems like ATP bioluminescence or impedance microbiology analyze microbial counts and contamination levels.

Pathogen Detection: Polymerase chain reaction (PCR) and enzyme-linked immunosorbent assay (ELISA) detect specific pathogens like Salmonella or Listeria.

5. Physical Properties:

Rheological Properties: Rheometers measure viscosity, elasticity, and flow behavior of fluids and semi-solid foods.

Water Activity: Moisture sorption analyzers determine water activity, which affects microbial stability and food quality.

6. Sensory Properties (Indirectly):

Electronic Noses: Gas sensor arrays detect volatile compounds related to aroma and flavor profiles.

Electronic Tongues: Sensor arrays analyze taste compounds and mimic sensory responses like sweetness, sourness, saltiness, and bitterness.

7. Shelf Life and Stability:

Oxidative Stability: Accelerated oxidation tests using instruments like Rancimat measure the stability of oils and fats.

Packaging Permeability: Gas chromatography measures the permeability of packaging materials to gases like oxygen and carbon dioxide.

Implementation and Benefits:

Accuracy and Precision: Instrumental methods provide objective and repeatable measurements, reducing subjectivity compared to sensory evaluation.

Efficiency: Rapid analysis reduces time and labor compared to traditional methods.

Comprehensive Analysis: Cover a wide range of parameters crucial for assessing food quality, safety, and nutritional value.

Regulatory Compliance: Help food manufacturers comply with regulatory standards and specifications.

