
UNIT 12 QUALITY CHARACTERISTICS

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12.0 OBJECTIVES

After reading this unit, you should be able to understand quality attributes:

- physical factors;
- appearance factors;
- textural factors;
- kinesthetic factors;
- chemical and microbiological characteristics;
- quality standards;
- quality evaluation;
- grading and certification; and
- adulteration of food- detection and prevention.

12.1 INTRODUCTION

Quality is combination of attributes, properties or characteristics that give a commodity value in term of human food. Quality is overall, consumer's satisfaction and value worth, which he is paying. It is necessary for the food industry to become quality conscious and move towards attaining the international quality standards. Following are the important component of quality.

1. Appearance
2. Texture or firmness
3. Flavour
4. Colour
5. Purity
6. Nutritional quality: Foods play a very significant role in human nutrition especially as source of carbohydrate, protein, fats, vitamins, minerals and dietary fibre.

Foods are often thought of as healthy and nutritive matter having no risk of food borne illness associated with their consumption. The probability of getting sick from eating raw or processed food should not exist. Preventing contamination of fresh and processed foods from human pathogens and dangerous levels of chemicals/pesticides residues is the best way to assure that foods are wholesome and safe for human consumption.

12.2 PHYSICAL FACTORS

The defects, disease and decay can impair quality of fresh horticultural commodities. Defects can originate before harvest as a result of damage by insects, diseases, birds and hail, chemical injuries, and various blemishes (scars, scabs, rusting, rind scrapping etc.). Post harvest defects include sprouting of potatoes, carrots, onions and garlic, rooting of onions and seed germination inside fruits such as tomatoes and peppers, presence of seed stems in cabbage and lettuce and floret opening in broccoli. Physical factors also include shrivelling and wilting, mechanical damage such as punctures, cuts, scratches, splits and crushing, skin abrasions, scuffing, deformation, compression, bruising, growth cracks in fruits and vegetables.

Temperature related defects (freezing, chilling, sunburn, sunscald) puffiness of tomatoes, blossom end rot of tomatoes, tip burn of lettuce, internal breakdown of stone fruits, water core of apples, black heart of potatoes are the physiological defects.

While most of these defects reduce post harvest quality of perishables. There are examples of defects that do not influence post harvest quality of fresh produce or which may be called as consumer-tolerable defects. These include healed frost damage, scars and scabs, healed insect stings, irregular shape, healed hail damage, sub-optimal colour uniformity, colour intensity variations etc. The presence of defects frequently lowers the grade of the produce, which are other wise of good quality.

Uncontrolled cold also will damage foods. If fruits and vegetables are allowed to freeze, they suffer discolouration, changes in texture, or cracked skins, leaving the food susceptible to attack by microorganism. Carefully controlled freezing on the other hand need not cause these defects. Fruits and vegetables

after harvest, like other living systems, have optimum temperature requirements. When held at refrigeration temperatures of about 4°C, some are weakened or killed due to chill injury and deteriorative processes follow. The deterioration includes off-colour development, surface pitting, and various forms of decay. Bananas, lemons, squash, and tomatoes are examples of products that should be held at temperatures not lower than about 10°C for maximum quality retention

12.3 APPEARANCE FACTORS

The quality of a food may simply be judged from its appearance when it is placed in front of a consumer. For example, a slight turbidity or cloudiness in orange juice is acceptable but not in apple juice, which must be crystal clear. Thus the overall eye appeal of a product is more important than taste and odour, and may determine acceptance or rejection without a trial tasting. Appearance deserves much more considerations in determining quality of a food and it includes size (dimensions, weight, volume), shape (diameter, depth ratio, smoothness, compactness, uniformity), colour (uniformity, intensity), gloss (nature of surface wax) and different external and internal defects.

Physical factors are such as size, shape, freedom from defect/damaged surface, type and extent of damaged parts. The optical properties such as colour, gloss and transparency of fruits and vegetables and the consistency of the processed products are also appearance factors that are indicative of quality. The appearance factors are highly useful and practiced in quality evaluation of fruits and vegetables, as well as in processed products.

Colour increases the attractiveness of many fruits and vegetables and used as a maturity index as colour undergo many changes as a part of the ripening process. Unripe fruit is usually green and in many types of fruit, the green colour becomes lighter during ripening and maturation owing to breakdown of chlorophyll, for example in apples, grapes, papaya. This may reveal underlying yellow or red pigments. Peel and pulp often undergo different colour changes, as in apples and bananas. In some cases, fruit colour is a strong indicator of eating quality and shelf-life, for example, tomatoes and bananas. Size and shape of fruits and vegetables are of major interest to the grower as it is directly proportional to the yield and also very useful in grading and handling during processing and transportation.

Defects may be caused by: (a) deformities caused by unfavourable environmental conditions (b) insects and microorganisms (c) mechanical injury during handling, transportation and processing such as damage, bruising and crushing (d) specks and sediments (e) foreign material or any other harmful added substance.

12.4 TEXTURAL FACTORS

Texture include various factors such softness, hardness, firmness, juiciness, grittiness or chewiness, fibrousness, mealiness and stickiness felt by the consumer when he handles the food with fingers (hand feel) or with the tongue, teeth or palate (mouth feel). Any deviation from the expected texture is said to be a quality defect. The texture of foods changes due to aging, improper processing or storage. Fresh fruits and vegetables become soggy due to over-ripening. Texture is an important factor in deciding the consumer acceptance

of a food. In fact, quality of a food is mainly judged by its freshness/ripeness/maturity or proper processing. For example, crispness of potato chips, the firmness and crunchiness of apples, and juiciness of fruit such as melons, non-sticky are indicative of prime quality of the food.

12.5 KINESTHETIC FACTORS

These are the quality factors which are judged by hands feel, mouth feel, and judged by sense of touch and tells about, chewiness, softness, juiciness, fibrousness, grittiness, mealiness, stickiness of fresh and processed foods.

12.6 FLAVOUR FACTORS

Flavour is a complex of taste and aromatic components. Total flavour can rarely be assessed by the consumer prior to purchase but it is critical in the repeat purchase of a particular product or product cultivars. Key taste components in fresh produce are sweetness, acidity, astringency and bitterness. Sweetness of some fruit may increase dramatically during ripening due to conversions of starch into sugars, for example in apples, bananas, mangoes and pears. Aroma may be fragrant, acidic & burnt and can be determined to some extent before purchase by the consumer but it tends to be important as a positive factor only in highly aromatic products such as certain cultivars of melon or mangoes.

Evaluation of flavour factor is highly subjective and depends on the discriminating ability of the consumer as flavour includes the sense of smell as well as the sense of taste as experienced by a consumer. People differ in their sensitivity to different odours and tastes as much as in their preference for various types of foods. In addition, consumers are influenced to some extent on the appearance, colour and texture of the food while evaluating the flavour characteristics.

12.7 CHEMICAL AND MICROBIOLOGICAL CHARACTERISTICS

12.7.1 Chemical Characteristics

Lipid oxidation and non-enzymatic browning are two major chemical characteristics which, affect the quality of fruits and vegetables during processing and storage and lead to a deterioration in sensory qualities.

Lipid oxidation results in production of off flavour as well as loss of ascorbic acid. It is influenced by light, oxygen concentration, high temperature, sunlight and the presence of iron and copper, and water activity. Control of these factors can significantly reduce the extent of lipid oxidation in foods.

Non-enzymic browning is one of the major causes of quality deterioration and takes place during frying, cooking, storage of dried and concentrated foods. The non enzymic browning is caused by the reaction of amino acids and reducing sugars through Mallard reaction, leading to insoluble black brown pigments which , produce bitter taste and loss in nutrients.

There is some loss of colour in fruits and vegetable during maturation, ripening, storage and processing due the degradation of chlorophyll, anthocyanins and carotenoids by oxidation. For example, dehydrated green peas and beans packed in clear glass containers undergo photo-oxidation and loss of desirable colour occur.

More than 150 reddish water-soluble anthocyanin pigments are present in the plant kingdom. Some anthocyanins form complexes with metals such as Al, Fe, Cu and Sn. by chemical reaction. These complexes generally result in a change in the colour of the pigment (for example, red sour cherries react with tin to form a purple complex) and are therefore undesirable. Since metal packaging materials such as cans could be sources of these metals, they are usually coated with special organic linings to avoid these undesirable reactions.

The carotenoids are a group of mainly lipid soluble compounds responsible for many of the yellow and red colours of food products. The main cause of carotenoids degradation in foods is oxidation. The mechanism of oxidation in processed foods is complex and depends on many factors. The pigments may auto-oxidise by reaction with atmospheric oxygen due to light, heat and the presence of pro-and anti-oxidants.

Ascorbic acid is the most important vitamin in fruits and vegetables and its stability vary markedly as a function of environmental conditions such as pH , concentration of trace metal ions and oxygen because it is oxidized in the presence of oxygen.

12.7.2 Microbiological Characteristics

The microbial action is associated with the presence of bacteria, yeasts and moulds on vegetables and fruits resulting in deterioration of quality during normal processes of aging. The microbial attack on fruits and vegetable and their processed products usually alter the appearance, texture, colour, odour, flavour or slime formation. The appearance includes colour changes, visible growth of microorganisms, formation of pockets of gas and microbial growth especially that of moulds on the surface of food products. As some foods deteriorate, they become soft or mushy. Degradation of foods results in the formation of compounds that have unacceptable odours and flavours.

The most common microbial spoilages in fruits and vegetables are mildew, brown rot, soft rot, black rot, green rot, mould rot or souring and water soaked musky areas, brown or white patches. These spoilage of quality are caused by *Penicillium italicum*, *Aspergillus niger*, *Alternaria sp.*, *Mucor sp.*, *Byssoschlamys fulva*, *Botrytis cinerea*, *Rhizopus nigricans*, and saprophytic bacteria.. Dry rots often lead to darkening and discolouring, and hardening of the surface of vegetables and fruits.



Check Your Progress Exercise 1

Note: a) Use the space below for your answer.
b) Compare your answers with those given at the end of the unit.

1. Describe quality.

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2. What are the quality characteristics of foods?

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3. List the main chemical characteristics.

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4. What are the main spoilage in fruits and vegetables?

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12.8 QUALITY STANDARDS

Different standards are employed to control the quality of fresh and processed foods in the country. Food standards for ensuring the quality and safety of foods for human consumption have been formulated and enforced by law in India. Food standards have been also prescribed based on the International Codex Alimentarius with suitable modification to suit Indian conditions. Different quality standards are summarized below.

Different Quality Standards

Name of standard	Features
a) Legal standards	<ul style="list-style-type: none"> – Mandatory standard established by federal state or municipal agencies. – Set up by law or represented by appropriate act. – Concerned with freedom from adulteration and proper quality control measures i.e. insects, moulds, yeasts, pesticides, maximum limit of preservative and food without contamination.
b) Company standards	<ul style="list-style-type: none"> – Established by food industry. – Represent consumers image and become trademark of symbol of product quality. – Are used by private firms or supermarkets.
c) Industry standard	<ul style="list-style-type: none"> – Established by an organised group for any given commodity. – Become effective by pressure from market organization or specific commodity group where legal standards are not involved.
d) Consumer or grade standards	<ul style="list-style-type: none"> – Represent consumer's requirement of a grade/standard product. – Based on experience in use by the industry for consumers.

The different standards take into consideration intrinsic qualities of foods, nutritional aspects, hygienic values and consumer appeal. Some standards are voluntary in nature and some are mandatory.

12.8.1 Legal Standards

These are also called as Health Ministry (Government of India) standards and are mandatory in nature. They are prescribed to ensure minimum quality in the foods marketed and promulgated under the Prevention of Food Adulteration Act other Rules and Orders of Government of India which cover food items: beverages, starchy foods, spices and condiments, sweetening agents, edible fats, milk and milk products, common salt, fruit products, edible oils, cereal products, vanaspati, vinegar, sweets and confectionary, food colours, limits for preservatives, antioxidants, emulsifying and stabilizing agents, flavouring agents, pesticide residues.

Quality denotes the degree of excellence of a product. It is indicated in terms of grades, standards and specifications which are laid down by a competent authority in the country. It is an important consideration in marketing of a product. Consumers are concerned about the safety, nutritional quality, aesthetic value, convenience to use and cost of foods. An established system of quality control assures uniformity in standards and thereby ensures that each food stuff is what it possess to be and what its label declares, if there is one.

12.8.2 Market Standards

The market dictates some quality parameters in the food stuffs marketed. There can be more than one quality requirement for a particular commodity. The economic status and quality consciousness of the consumer influences the market standards and they are voluntary in nature. Examples are different grades of fruits, vegetables, rice with more or less broken, pulses etc.

12.8.3 Industry Standards

These standards require special quality factors in the foods the consumer purchase. Wheat miller requires wheat with high milling yield. A baker will require a wheat flour with high percentage of gluten of good strength to obtain a good loaf of bread. Similarly fruit processing industry will require certain specific qualities in the fruits like colour, flavour when they are purchased.

12.9 QUALITY EVALUATION

The quality evaluation of fruits, vegetables, other foods and processed products gives useful information on nutritional and biochemical characteristics. Quality evaluation methods can be destructive or non-destructive. They include both objective (based on instrument readings) such as physical, chemical, or microbiological and subjective (based on human judgment, using hedonic scales) methods as in taste. Subjective methods are also called as sensory analysis.

The physical, chemical and microbiological analytical methods are considered to be objective. These methods are usually standard scientific tests, which, one should be in a position to reproduce with the same results by any trained technician. Physical measurements include product attributes such as; size, weight, colour, texture, headspace and even impurities such as filth and insects. Chemical methods are usually more complex and often require sophisticated instrumentation. Precise tests for moisture, total soluble solids, titratable acidity, vitamins, colour pigments, proteins, carbohydrates, ash, pectin and fiber have become standard practice. Microbiological methods are used to determine the presence of bacteria, moulds and yeasts. The details of some of the methods used in the quality evaluation are given below:

12.9.1 Appearance Quality

Appearance quality of fruits and vegetables is measured by size, shape, colour, gloss and presence physical defects.

Size: Dimension-measured with sizing rings, calipers. Weight-correlation is generally good between size and weight.

Shape: Ratio of dimensions – such as diameter/depth ratio used as indices of shape in fruits.

Colour: Uniformity and intensity-important appearance qualities. Visual matching- colour charts to match and describe colours of fruits and vegetables. Light reflectance is measured by Hunter Lab Colour Meters and Agtron E5W spectrophotometer. Light transmission meters are used to determine internal colour and various disorders (water core of apples and black heart of potatoes). Lovibond tintometer is also used to judge the colour and it has universal acceptance. Determination of pigments (chlorophylls carotenoids, carotene, lycopene, xanthophylls), and flavonoids (anthocyanins) is done by colourimetric procedures.

Gloss (bloom, finish): measured using a Gloss-meter or by visual evaluation.

Presence of defects (external and internal): Evaluated using a scoring system of 1 to 5 (1 = no symptoms, 2 = slight, 3 = moderate, 4 = severe, and 5 = extreme). Which may be expanded to a 1 to 7 or 1 to 9 hedonic scale.

12.9.2 Textural Quality

Yielding quality (firmness, softness): Hand-held testers - determine penetration force using testers such as the Magness-Taylor Pressure Tester and the Effegi penetrometer. Laboratory testing-fruit firmness is determined by Instron Universal Testing machine or Texture Analyser or by measuring fruit deformation using a Deformation Taster.

Fibrousness and toughness: Measured on by Instron or Texture Testing System a Fibrometer.

Succulence and juiciness: Measurement of water and extractable juice contents are the indicators of succulence and juiciness.

Sensory textural: Evaluate grittiness, crispness, mealiness, chewiness and oiliness.

12.9.3 Flavour Quality

Sweetness: Sugars are determined by colourimetric methods. For quick measurement of glucose in field, is done by enzyme coated strips. Total soluble solids contents are (sweetness) are measured using refractometers.

Sourness (acidity): pH of juice is determined by pH meter or pH indicator paper. Total titratable acidity is determined by titrating the extracted juice with alkali to pH 8.1.

Saltiness: Salt is determined by chemical method. Saltiness can be measured subjectively by sensory evaluation.

Astringency: Determined by taste testing or measuring tannin contents.

Bitterness: Determined by taste testing or measurement of the glyco-alkaloids.

Aroma (odour): Determined by sensory panels in combination with identification of volatile components.

Sensory evaluation: Human subjects – judge and measure combined sensory characteristics (sweetness, astringency, bitterness, overall flavour intensity) of a commodity.

12.9.4 Nutritional Value

Various analytical methods are available for determination of total carbohydrates, dietary fibre, proteins, amino acids, lipids, fatty acids, vitamins, and minerals in fruits and vegetables.

Eating Quality Factors: These include sweetness, sourness, astringency, bitterness, aroma and off-flavours. Objective analytical determination of critical components must be coupled with subjective evaluations by a taste panel to yield useful and meaningful information about flavour quality of fresh fruits and vegetables.

12.9.5 Non Destructive Methods

Acoustic and vibration tests: The sound of a fruit as it is tapped sharply with a finger knuckle can change during maturation and ripening and this method is used by consumers while purchasing fruits. Melons are tapped to judge whether they are ready to be harvested.

Electrical properties: Electrical properties of the fruit change with the soundness or maturity or spoilage or physical damage of the fruit. It has been found that the capacitance of deteriorated cell increased while resistance decreased and therefore the measurements could be used to determine the freshness or age of the fruit. At 500 Hertz the dielectric constant of green and ripe peaches was 550 and 150 respectively.

Nuclear magnetic resonance (NMR): NMR is being used to find the maturity & quality of fruits and it is also correlated well to sugar content of bananas & apples, and oil content in avocado. It has been used to detect bruises on apples, peaches, pears and onions, pits in olives and prunes and insect damage in pears.

Near Infrared Reflectance (NIR): It has been studied to measure the internal qualities like sugars, acidity, soluble solids, nitrogen & calcium in apples, peaches, pineapples, mango and pear. It is used to find the fruit firmness & their storability in cold stores.

Sonic techniques: Based on the generation of resonating frequency that can be used to calculate internal resistance (hardness).

12.9.6 Summary of Methods of Determining Quality

Subjective*	<ul style="list-style-type: none"> – Include sense organs – Based on opinion of investigators – Past training experience of individual's power or perception – Statistical Analysis required to get meaningful results
Objective**	<ul style="list-style-type: none"> – Based on scientific tests – No human perception is involved
a) Physical method	<ul style="list-style-type: none"> – Size, texture, colour, consistency, headspace, fill and drained weight, vacuum, container, symmetry, defects, viscosity

b) Chemical methods	<ul style="list-style-type: none"> – Enzyme, moisture, fibre, pH, acidity, protein, specific gravity, fat/oil, carbohydrate, ash, mineral, vitamins, sugars, tannins, alcohols
c) Microbiological methods	<ul style="list-style-type: none"> – Mold, insect fragments, insect, excreta, foreign material – Differentiation between cell types/tissue/microorganisms – Determination of microbial count spoilage detection in the fresh and processed products, microorganisms causing spoilage/fermentation

**Subjective*: The human eye is used to evaluate colour.

***Objective*: An instrument is used to provide a special colour value based on the amount of light reflected-off the commodity surface or the light reflected through the commodity. e.g. Lovibond tintometer.

12.10 GRADING AND CERTIFICATION

The fruits, vegetables and other foods are graded according to size, shape, weight, colour and visible defects to obtain uniform quality and fetch good price for the fruits. This is done by hand or machines. Automatic grading machines are available in which vibrating screens or screens with various sized slots are used to separate different types of product. *Density grading* is carried out by using different concentration of brine for fruits. Grading for colour is carried out by an electronic colour-sensing device. Manual grading done by hands and is usually necessary to avoid losses or to keep losses within reasonable limits.

To ensure quality and purity, Government of India, has established different agencies like AGMARK, Indian Standard Institute to make grades of foods, vegetables & fruits and they are affixing their marks (Agmark, ISI) on the products. The quality of product is determined with reference to the size, variety, weight, colour, moisture and, fats content and other factors. The act defines the quality of most of the agricultural raw and processed products commodities into various grades depending upon the degree of purity in each case. The grades incorporated are grades 1, 2, 3 and 4 or special, good, fair and ordinary. The physical and chemical characteristics of products are kept in mind while formulating the Agmark specifications.

Grading of commodities like ghee, butter, vegetable oils, *atta*, spices and honey is voluntary. On the other hand, grading of spices, basmati rice, essential oils, onions, potatoes etc. that are meant for export, is compulsory under AGMARK to ensure quality. The grading of agricultural commodities has three main purposes to: (i) to protect the producers and consumer from exploitation. By knowing the quality and grade of his produce, he is in better bargaining position against the trader. (ii) serve as a means of describing the quality of the commodities to be purchased *or* sold by the buyers and sellers in the country and abroad. Which avoids the need for physical checking and handling at many points. (iii) protect the consumer by ensuring the quality of products he purchases.

Under Indian Standard Specification fruits and vegetables have three grades, super, fancy and commercial.

Super: The fruits and vegetables under this grade shall be of similar variety characters, fresh, firm, i.e. not withered or wilted, tender, succulent, well shaped, fairly smooth clean and well coloured which means that the commodity has a uniform good colour characteristics of the variety over practically the entire surface, well developed, uniform in size, free from injuries and damage by scars, insects, diseases or mechanical or other means.

Fancy: The fruits and vegetables under this grade shall be of similar variety characters, fresh, firm, tender, succulent, well shaped, fairly smooth clean and well coloured. And are free from, injuries, damage by disease, insects, mechanical or other means.

Commercial: The fruits and vegetables under this grade shall consists which do not conform to the requirements of either super or fancy grade, but the quality is fit for use of human consumption.

12.10.1 Certification

The Bureau of Indian Standards, (BIS) Act, 1986, operates a product certification scheme, including Food and Agriculture. The certification allows the licensees to use the popular ISI Mark, which has become synonymous with Quality products for the Indian markets.

The BIS certification is voluntary, and aims at providing quality, safety and dependability to the customer. All BIS certifications are carried out on Indian Standards, which have been found amenable to product certification. Presence of certification mark known as Standard Mark on a product is an assurance of conformity to the specifications. The conformity is ensured by regular surveillance of the licensee's performance by surprise inspections and testing of samples, drawn both from the factory and the market.

The Govt. of India on considerations of public health & safety, and mass consumption has enforced mandatory certifications of 135 products through Orders issued under various Acts. While the Bureau grants licenses only on application however the enforcement of compulsory certification is done by the notified authorities and the Bureau maintains a close vigil on the quality of goods certified through its surveillance operations.

The broad area of food and agriculture under certification are: processed fruits and vegetable products, spices and condiments, bakery, confectionery and nutritious supplements, dairy products, drinks and carbonated beverages, fish and fisheries products, food additives, food analysis and nutrition, food hygiene, food microbiology, food grains, livestock feeds, oils and oilseeds, pesticides residue analysis.

12.11 ADULTERATION OF FOOD – DETECTION AND PREVENTION

Food is consumed should be pure provide energy and nutrition and as such it should be wholesome and not have deleterious substances. The food adulteration implies that food lack certain standard of quality or purity and, is a great menace to public health, posing serious threat to the society.

Food adulteration is defined as the process by which the quality or the nature of a food product is adversely affected through the addition of a foreign or an inferior substance and the removal of a vital element, such as fat from milks

and the addition of water to it. Adulteration of food may endanger health due to either addition of a deleterious substance or removal of a vital component. Adulteration may be intentional or unintentional. The intentional adulteration is a willful act intended to increase the margin of profit while the incidental contamination is usually due to ignorance, negligence or lack of proper checking facilities. Adulteration of food stuffs is commonly practiced in India as the consumers like to get maximum quantity for as low a price as possible. When the price of the food product is higher than the price, which the consumer is prepared to pay, seller is compelled to supply a food product of inferior quality, thus adulteration done.

12.11.1 Types of Adulterants

i) Intentional adulterants	<i>Substances added to food are:</i> sand, marble chips, stones, mud, other filth, talc, chalk powder, water, mineral oil, harmful colours.
ii) Incidental adulterants	They are pesticide residues, tin from can, droppings of rodent's larvae in foods.

We are eating foods daily laced with some toxic pesticides. Even the rodents and insects introduce into the food a high degree of filth in the form of excreta, bodily secretions and microorganisms responsible for food spoilage as well as its intoxication. The incidental poisoning can be prevented by the following:

- Regular 'market basket' surveys to warn people of dangerous build-up of toxins in food.
- Stepping up the integrated pest management programme to educate farmers about the judicious use of pesticides. No spraying should be done a week before harvest.
- Promoting the control of pests using their natural predators.
- Preventing industries from dumping poisonous effluents.
- Considering health costs while deciding pesticide policy.
- Use of safer pesticides like synthetic pyrethroids or malathion.
- Thorough washing of foods to get rid of much of toxins.

12.11.2 Detection of Food Adulteration

Few important food adulterants and simple tests to detect adulteration of foods

Substance	Adulterant	Tests
1	2	3
<i>Tur dal</i>	<i>Lakh dal</i> or metanil	1. <i>Lakh dal</i> is irregular in shape and of lighter, colour than tur dal 2. Add concentrated HCl to moisten dal. Yellow colour Will turn into magenta red if metanil yellow is present.

Quality Aspects

Dals	Kesari dal Clay, stones, gravels Lead chromate (yellow)	Add 50 ml of dilute HCl to dal and keep on simmering water for about 15 min. The development of pink colour indicates the presence of kesari dal. Visual examination detects these adulterants. Shake 5 g of dal with 5 ml of water and add a few drops of HCl. A pink colour shows the presence of colour.
Bajra	Fungus	Immerse in saline water, fungi will come on top
Wheat, bajra and other food grains	Ergot (a fungus containing a poisonous substance) Dhatara seeds	a) Longer size purple black grains in bajra show the presence of ergots. b) Put some grains in a glass containing 20% salt solution. Ergot floats over the surface, while sound grains settle down. Dhatara seeds resemble chilly seeds with blackish brown colour which can be separated out by close examination
Tea leaves	Exhausted tea or black or bengal gram dal husk with colour	a) Tea leaves sprinkled on wet filter paper would immediately release added colour b) Spread the little slaked lime on white porcelain tile or glass plate. Sprinkling a little tea dust on the lime will show the presence of coal tar dye. In the case of genuine tea, there will be only a slight greenish yellow colour due to chlorophyll which appears after sometime.
Mustard seeds	Argemone seeds	Argemone seeds have no round structure, they are pointed and are mere blackish than mustard seeds.
Chilli powder	Saw-dust and red colour	Sprinkle on the surface of water. Saw-dust floats. Added colour will colour the water.
Edible oils	Argemone oil Mineral oil	Add concentrated nitric acid to the sample and shake carefully. Red to reddish brown colour in acid layer would indicate the presence of argemone oil. Take 2 ml of edible oil and add equal quantity of N/2 alcoholic potash. Heat in boiling water bath for 15 min and add 10 ml of water. Any turbidity shows the presence of mineral oil.

	Castor oil	Dissolve some oil in petroleum ether in a test tube and cool in ice salt mixture. Presence of turbidity within 5 min indicates the presence of castor oil.
Turmeric	Coloured saw dust, metanil yellow Starch	Take a teaspoon full of turmeric powder in a test tube. Add a few drops of concentrated HCl. There is instant appearance of violet colour which disappears on dilution with water. If the metanil yellow colour persists (an artificial dye) the presence of non- permitted coal tar is indicated. Add iodine solution to turmeric solution, it will turn violet if starch is present.
Coriander	Horse dung powder	Soak in water. Horse dung will float which can be easily detected.
Ghee or Butter	Vanaspati Mashed potatoes, sweet potato and other starches.	Take about one teaspoonful of melted ghee or butter with equal quantity of concentrated HCl in a test tube and add to it a pinch of cane sugar. Shake well for one minute and observe it after 5 min. Appearance of crimson colour in lower (acidic) layer shows the presence of 'vanaspati'. The presence of mashed potatoes and sweet potatoes in a sample of butter can easily be detected by adding a drop of tincture of iodine. The appearance of blue colour indicates the presence of mashed potato, sweet potato or other starches.
Black pepper	Dried seeds of papaya fruit Light berries	Papaya seeds can be separated out from pepper as they are shrunken, oval in shape and greenish brown or brownish black in colour. The suspected papaya seed in black pepper sample is distinguishable by its characteristic repulsive flavour quite distinct from the bite of black pepper. Light berries float on spirit.
Rice	Marble or other stones	Place a small quantity of rice on the palm of the hand and gradually immerse the same in water. The stone chips will sink.

Quality Aspects

Wheat flour (maida)	Atta from which maida suji has been extracted	When dough is prepared from resultant wheat flour, more water has to be used and chapattis prepared out of this will blow out. The normal taste of chapattis prepared out of wheat is somewhat sweetish whereas those prepared out of adulterated wheat flour will taste insipid.
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12.11.3 Prevention of Food Adulteration

To safeguard the interest of the consumer, it is necessary to have a check and control over the quality of food marketed for human consumption.

In India “Prevention of Food Adulteration Act” was promulgated by the Government in 1954 and the Rules under this act were made in 1955. The act was intended to make provisions for the prevention of adulteration in food. The act empowers the government agencies to prevent this unsocial activity and safeguard the health of the people. The implementation of the Act/Rules is done at State/Union territory level whereas the Central Government may give such directions it may deem necessary regarding execution of the provisions in the Act/Rules. For this purpose, the ‘Central Committee for Food Standards’ was constituted with (a) members representing concerned ministries, (b) representatives of consumers, medical professionals, agricultural, commercial and industrial organizations and hotel industry, (c) representatives of State/Union territories and (d) Directors of the Central Food Laboratories and (e) Director General of Health Services. Four Central Food Laboratories and a number of state level laboratories were established for analysis of samples collected by the state level food inspectors.

Standards under PFA Act and Rules: The standards laid down under the PFA Act and Rules are minimum standards of purity and are based on the agricultural practices, climatic conditions prevailing, and economic conditions and nutritional status of the people in the country

The standards are mandatory in nature and by government laws food articles which do not conform to the standards are considered unfit for human consumption. The Act and Rules deal with preservatives, poisonous metals, naturally occurring toxic substances, anti-oxidants, emulsifying and stabilizing agents, flavouring agents, colouring matter and other food additives, insecticides and pesticides, solvent extracted oils and edible flours, non-alcoholic beverages, starchy foods, spices and condiments and their mixes, honey, jaggery, saccharin, coffee, tea and milk, milk products, edible oils, cereals, baked products, sweets and confectionary and a range of similar products. The Act and Rules deal with the administrative procedures to be followed for reporting, analysis, prosecution, presentation of cases in a court of law and punishment to be carried out.

The adulterated food articles are defined under the Act.

12.11.4 Prevention of Food Adulteration Tips to Consumer

Despite the advantages of modern technology, illness due to adulterated/contaminated food is one of the leading causes of sickness or death. Food-borne diseases range from acute gastroenteritis to precancerous/cancerous

stage. Consumers are therefore offered tips in ascertaining quality of food by quick and simple tests for detection of common adulterants in food.

- Read label before purchasing.
- Purchase food articles from licensed vendors and insist on Bill or Cash Memo.
- Prefer foods sold in packed containers even if the cost is higher.
- Prefer foods certified by Govt. agencies like Agmark, ISI certification mark and FPO
- Avoid coloured foods especially sweetmeats or sharbats or ice candy.
- Buy foods from reputed firms.
- Do not buy cut or exposed fruits or vegetables.
- Do not use containers or packages used for insecticide chemicals or non-edible items.

Check Your Progress Exercise 2



Note: a) Use the space below for your answer.
b) Compare your answers with those given at the end of the unit.

1. What do you understand about quality standard?

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2. How many types of adulterants are there and the Act to prevent adulteration?

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3. What is Agmark?

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4. What are the benefits of grading and certification?

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5. Name the method of quality evaluation?

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12.12 LET US SUM UP

Quality of food is a combination of attributes, properties or characteristics that give a commodity value in terms of human food. The important components of quality are: appearance, texture or firmness, flavour, colour, purity and nutritional quality. Food plays a very significant role in human nutrition especially as source of carbohydrate, protein, fats, vitamins, minerals and dietary fibre. Lipid oxidation and non-enzymatic browning in fruits and vegetable are two major chemical characteristics, which affect the quality of food during processing and storage. The microbiological characteristics are associated with the presence of bacteria, yeasts and moulds on foods resulting in deterioration of quality.

Different quality standards are formulated and enforced by Government of India to ensure food quality and safety for human consumption. The quality evaluation of fruits, vegetables, other foods and processed products gives useful information on nutritional and biochemical characteristics and can be determined by destructive or non-destructive methods. These include both objective such as physical, chemical, or microbiological methods and subjective such as taste. Food adulteration is defined as the process by which the quality or the nature of a food product is adversely affected through the addition of a foreign or an inferior substance and the removal of a vital element. Adulteration may be intentional or unintentional. In India “Prevention of Food Adulteration Act” was promulgated by the Government to make provisions for the prevention of adulteration in food by law.

The fruits, vegetables and other foods are graded according to size, shape, weight, colour and visible defects to obtain uniform quality which is done by hand or machines. Automatic grading machines are available. Grading for colour, an electronic colour-sensing device is used. To ensure quality and purity, Government of India, has established Agricultural Produce Grading and Marketing Act (Agmark), and Indian Standard Institute to make grades of foods, vegetables and fruits & they are affixing the Agmark & ISI quality mark respectively on the products. The Bureau of Indian Standards, (BIS) Act, operates a product certification scheme, including Food and Agriculture. The certification allows the licensees to use the ISI Mark, which insure quality of products. The BIS certification is voluntary, and aims at providing quality, safety and dependability to the customer. All BIS certifications are carried out on Indian Standards, which have been found amenable to product certification.

12.13 KEY WORDS

- Quality** : It is a measure of the degree of excellence or degree of acceptability by the consumer.
- Appearance** : It include size, shape, colour, gloss and other visible defects of foods.
- Texture** : It include softness, hardness, firmness, juiciness, chewiness, mealiness & stickiness, of the food commodity.
- Flavour** : It is a complex of taste and aroma.
- Chemical characteristics** : The lipid oxidation and non enzymatic browning are the chemical reactions of the rancidity and browning of foods respectively.
- Microbiological characteristics** : The microbiological characteristics are associated with the presence of bacteria, yeasts and moulds on foods resulting in deterioration of quality attributes
- Quality standards** : They are something that is set up and established by the authority for measuring quality.
- Quality evaluation** : The quality evaluation gives information on nutritional and biochemical characteristics of foods and determined by destructive or non-

- Adulteration** : destructive methods which can be objective or subjective.
- Grading** : Food adulteration is the process by which the quality or the nature of a food product is adversely affected by the addition of a foreign or an inferior substance.
- Certification** : The food products are graded according to size, shape, weight, colour and visible defects to obtain uniform quality.
- Hygiene** : The certification allows the licensees to use the quality Mark to insure quality of products and certification may be voluntary or mandatory.
- It involves all measures to ensure the safety, soundness and wholesomeness of food at all stages of production and processing.

 **12.14 ANSWERS TO CHECK YOUR PROGRESS EXERCISES**

Check Your Progress Exercise 1

1. Your answer should include the following points:
 - Quality is combination of attributes, properties or characteristics that give a commodity value in term of human food.
 - Quality is overall, consumer's satisfaction and value worth.
 - Appearance, firmness, flavour, colour, purity, nutritional quality:
2. Your answer should include the following points:
 - Physical characteristics.
 - Chemical characteristics.
 - Nutritional characteristics.
3. Your answer should include the following points:
 - Lipid of oxidation.
 - Non-enzymatic browning.
 - Rancidity.
 - Maillard reaction.
4. Your answer should include the following points:
 - Mildew
 - Brown rot
 - Soft rot
 - Black rot
 - Green rot
 - Mould rot
 - Souring

Check Your Progress Exercise 2

1. Your answer should include the following points:
 - Different standards for ensuring the quality and safety of foods for human consumption have been formulated and enforced by law in India.
 - Legal standards.
 - Company standards.
 - Industry standards.
 - Consumer or grade standards.
2. Your answer should include the following points:
 - Intentional adulterants.
 - Incidental adulterants.
 - Prevention of Food Adulteration Act 1955.
3. Your answer should include the following points:
 - Derivative of Agricultural Marketing.
 - Agricultural Produce Act, 1937.
 - AGMARK products are free from adulteration.
4. Your answer should include the following points:
 - Uniform quality and fetch good price.
 - The grades are 1, 2, 3, & 4.
 - Special, good, fair and ordinary grades.
 - Super, fancy & commercially grades.
 - BIS Act.
 - ISI mark.
5. Your answer should include the following points:
 - Physical, Chemical and Microbiological methods.
 - Objective and subjective methods.
 - Non-destructive methods.

12.15 SOME USEFUL BOOKS

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