

# **Introduction to Food Technology, General Aspect of Food Industry**

**Module- 1**

**Lec- 1**

**Dr. Shishir Sinha**

**Dept. of Chemical Engineering**

**IIT Roorkee**

## **Introduction to Food Technology**

### **The Importance and Source of Food**

The raw products of present day foods generally originate from two major sources: the plant and animal kingdoms. We still rely on the agricultural lands, lakes, rivers, and the seas for their origin in forests and wildlife, and in many parts of the world they still constitute important sources of food. The plant and animal products that compose our foods and food products may be classified in the following way:

#### **Plant Products**

**A. Grains (cereals)** wheat, corn (maize), sorghum (kaoliang, jowar), barley, oats, rye, millets (including ragi), rice, adlay, buckwheat

**B. Pulses** beans (red kidney), lima beans, navy beans, peas, lentils, broad beans, cowpea (chickpea), vetch (fitches)

#### **C. Fruits**

1. Tropical fruits banana, plantain, pineapple, papaya, guava, mango, passion fruit, breadfruit, avocado, zapote, cherimoya, naranjilla, surina (Brazil) cherry.
2. Subtropical fruits
  - (a) Citrus fruits orange, lemon, tangerine, grapefruit, pomelo, citron, lime, kumquat.
  - (b) Other figs, pomegranate, olives, persimmon tunas (cactus figs), peijabe.
3. Deciduous fruits Pome (seed) fruits, Apple, Grapes, Pear, Quince.
4. Stone fruits peach, cherry, plum, apricot.
5. Berries strawberries, raspberries, black raspberries, blackberries, loganberries, boysenberries, cloudberries, blueberries, cranberries, lingo berries (whortleberries), elderberries, black currants, red currants, gooseberries, rose hips.

#### **D. Melons and squashes**

cantaloupe, honeydew, watermelon, squashes.

### **E. Vegetables**

1. Leaf(y) vegetables cabbage, Brussels sprouts, spinach, celery, artichoke, leeks, lettuce, endive, bamboo shoots, heart of palms, herbs.
2. Root vegetables carrot, radish, parsnip, turnip, rutabaga, salsify.
3. Seeds green peas, green beans, lima beans, okra.
4. Others cauliflower and broccoli, cucumbers, onions, garlic, tomatoes.

### **F. Tuber products**

(Irish or white) potatoes, sweet potatoes (yams), taro, cassava (manioc), Jerusalem artichoke (topinambur), true yams (*Dioscorea* spp.), earth almonds.

### **G. Nuts**

Almond, beech, Brazil nut, breadnut, butternut, cashew, chestnut, filbert, peanut (groundnut), pecan, pinole, pistachio, walnut.

### **H. Fungi**

- (1) Fat type bakers' yeast, brewers' yeast, food yeast
  - (2) Protein type champignon, truffles, morels, anthrems
- miscellaneous, I. Honey (nectar)

### **I. Manna**

Ash tree, oak, tamarisk, alhagi

### **J. Sugars** sugar cane, sugar beet, maple syrup

palm sugar (date).

### **K. Oilseeds soybean**

olive, cottonseed, peanut (groundnut), sunflower, palm kernels, coconut (copra), rapeseed, sesame.

### **L. Seaweeds**

Laver, nori (*Porphyra* spp.), kombu (*Laminaria* spp.), wakame (*Undaria pinnatifida*)

**M. Beverage ingredients** Coffee, tea, cocoa, yerba mate, miscellaneous (mint, fenugreek, tilia, etc.)

The above given items are major items of plant and animal origin that compose the multitude of food articles available at present-day markets. They also constitute the raw material for a number of major industries & manufactured products. The major manufactured food products are listed below:

1. Sugars: cane, beet, maple, corn.
2. Starches: corn, potato, cassava (manioc), arrowroot, sago, wheat.
3. Flour, bread, and cereals.
4. Sweet baked goods.
5. Confectionery products.
6. Canned foods.
7. Frozen foods.
8. Dried (dehydrated) foods.
9. Pickled and marinated foods.
10. Salted and cured foods.
11. Dairy products: market milk (homogenized), cheese, butter, cultured milks, ice cream, dry nonfat solids, milk concentrates.
12. Meat products: sausages, hams, luncheon meats, meat extract, pastes.
13. Seafood products: fillets, fish sticks, breaded shrimp, sausages, pastes.
14. Oleomargarine and other food fats and oils: soybean, corn, sunflower, cotton seed, olive.
15. Jams and jellies
16. Fermented foods: pickles, sauerkraut, fish sauces.
17. Fermented beverages: wine, beer.
18. Soft drinks: carbonated and still drinks.
19. Mixes: baking, soup.
20. Soybean products.
21. Corn products.
22. Yeast: food yeast, bakers' yeast, brewers' yeast.
23. Fish flour.

24. Protein hydrolyzates.

25. Imitation foods (spun proteins, fruit drinks, synthetic cream, etc.)

## **Raw material selection**

### **Definition of Quality**

Degree of excellence and include such things as taste, appearance, and nutritional content.

The composite of characteristics that have significance and make for acceptability

- **Quality Factors in Foods**
  - **Appearance Factors**
  - **Textural Factors**
  - **Flavor Factors**
  - **Additional Quality Factors**

### **Appearance Factors**

Include such things as;

- Size
- Shape
- Wholeness
- Different forms of damage
- Glass
- Transparency
- Color
- Consistency
- Size and shape
- Easily measured
- Important factors in federal and state grade

- **Size**

Approximated by weight after rough grading

Ex. Determining the weight of dozen eggs

- **Shape**

Have more than visual importance

The grades of certain types of pickles include the degree of curvature

- **Color and Gloss**

Color is commonly an index of ripeness and spoilage:

Potatoes darken in color as they are fried

Bleaching of dried tomato powder on storage

- **Consistency**

May be considered a textural quality attribute

Measured by viscosity of food:

- Higher viscosity – higher consistency
- Lower viscosity products – lower consistency

- **Texture Factors**

Texture Refers to those qualities of food that we can feel either with the fingers, the tongue, the palate or the teeth.

A departure from an expected texture is a “quality defect”.

- Expected texture
  - Chewing gum to be chewy
  - Crackers and potato chips to be crisp
  - Steak to be compressible and shearable between the teeth

- **Flavor factors**

Flavor A combination of both taste and smell

Largely subjective

Hard to measure because of difference of opinion:

People differ in

- Their sensitivity to detect different tastes and odors
- Their preference
- Their cultures

- **Additional Quality Factors**
- Nutritional Quality
- Sanitary Quality May not always be apparent by sensory observation.
- Keeping Quality

- **Nutritional Quality**

Can be assessed by chemical or instrumental analyses for specific nutrients, Animal feeding tests or equivalent biological tests must be used in many cases Particularly common in evaluating the quality of

- protein sources
- Interacting variables of
  - protein level
  - amino acid composition
  - digestibility
  - absorption of amino acid
- **Sanitary Quality** usually measured by counts of bacteria, yeast, mold, and insect, fragments sediment levels

### **Keeping Quality or storage stability**

Measured under storage and handling conditions

stimulated conditions:

- extremes of temperature
  - extremes of humidity
  - other variables
- **Principles of Quality Control**
  - Raw Material Control
    - The use of good and sound raw material is of primary importance for the achievement of the required end product of consistent quality.
  - Process Control

- Finished Product Inspection
- **The Importance of Raw Material Selection**
- A poor raw material cannot be converted into a good finished product.
- In food processing;
  - General rule:- the effective methods must be carefully applied to conserve the original qualities of the raw materials
  - cannot improve the raw material
- **Definition of Food Technology**

Food Technology is the application of food science to the selection, preservation, processing, packaging, distribution, and use of safe, nutritious, and wholesome food.

### **Scope of Food Technology**

- **Food Technology** developed as a discipline to systematically organize and link the various kinds of knowledge which are necessary to inform human activity in **food** handling, processing, distribution and marketing.
- **Food Technology** applies :
  1. The principles and concepts of engineering to problems of **food** handling and processing, and
  2. Studies the interrelationships between the properties of materials and the changing methods of handling and manufacturing them.

### **Food Business**

- The **food** business may be characterized as:
  - Vulnerable to spoilage,
  - High volume,
  - Low margin,
  - Multiple products,
  - Transportation intensive; and
  - End user marketing intensive.

- Since WWII the value added part of the **food** industry has increased steadily, and in 1980 surpassed agriculture's contribution.
- There is great emphasis on speed and efficiency in production, and on optimization of the **food** system from production through consumption.
- It has even been predicted that "nutrient delivery packages", customized for particular situations, will be developed to take the place of traditional "meals".

### **Components of Food Technology**

- Food analysis and chemistry
- Food Quality Factors and their Measurement
- Nutritive aspects of food constituents and effect of processing and handling
- Food microbiology, mycology, and toxicology
- Food processing and engineering

### **Emerging trends in Food Technology**

Increased concern about the nutritional content of technologically derived, refined foods is expressed by both consumers and nutritionists.

- Dietary guidelines and nutrition education focus on partially replacing refined foods with whole grains, legumes, and other foods which retain their biochemical unity.
- Concern about **food** safety issues is very strong. **Food** scientists are responding to these nutritional and safety concerns in a variety of ways,
- Increased attention to **food** interactions and bioavailability of nutrients,
- Improved analytical and detection methods, and research and education in **food** safety.
- New product development, particularly in the area of reduced-fat and reduced-calorie products is predicted. New processing technologies such as high energy electric pulse processing, freeze concentration, and hydrostatic pressure processing (which are often not yet available in the U.S.) show promise.
- Biotechnology is a growing area.

### **Impact of developments in other Technologies on Food Technology**

For the sake of completeness it should also be mentioned that development of **food technology** draws heavily on developments in other technologies, such as those in steel, tinsplate, glass, aluminum, plastics, engineering, instrumentation, electronics, chemicals, and agriculture.

## References

- [http://www.ub.edu/web/ub/en/estudis/oferta\\_formativa/graus/fitxa/F/G1052/presentacio/index.html](http://www.ub.edu/web/ub/en/estudis/oferta_formativa/graus/fitxa/F/G1052/presentacio/index.html)
- [http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&ved=0CD8QFjAC&url=http%3A%2F%2Fwww.newagepublishers.com%2Fsamplechapter%2F000294.pdf&ei=XhDzUojqJYz7rAfJhoHwAQ&usg=AFQjCNFP\\_IKNgis8bellQ2gQG9b1iDK8Pg&sig2=ycgfeBuskhQFZMq0rTeOGA](http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&ved=0CD8QFjAC&url=http%3A%2F%2Fwww.newagepublishers.com%2Fsamplechapter%2F000294.pdf&ei=XhDzUojqJYz7rAfJhoHwAQ&usg=AFQjCNFP_IKNgis8bellQ2gQG9b1iDK8Pg&sig2=ycgfeBuskhQFZMq0rTeOGA)
- <http://www.sciencedirect.com/science/book/9780126702569>
- [http://link.springer.com/chapter/10.1007%2F978-1-4684-6453-5\\_1#page-1](http://link.springer.com/chapter/10.1007%2F978-1-4684-6453-5_1#page-1)
- [http://en.wikipedia.org/wiki/Food\\_industry](http://en.wikipedia.org/wiki/Food_industry)
- [http://link.springer.com/chapter/10.1007%2F978-0-387-33957-3\\_13#page-1](http://link.springer.com/chapter/10.1007%2F978-0-387-33957-3_13#page-1)
- <http://www.intechopen.com/books/food-industry/quality-management-important-aspects-for-the-food-industry>
- <http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=6&cad=rja&ved=0CFYQFjAF&url=http%3A%2F%2Fnptel.ac.in%2Fcourses%2F103107088%2Fmodule1%2Flecture1%2Flecture1.pdf&ei=qhLzUsXTFoSFrgf8hYGABg&usg=AFQjCNF47bTxaBViLh0J7Z9TiGZrgrgRow&sig2=nw0yBxqwR0fO-2PwizMwEw>