3 Beverage Technology

Contents

Beverages are integral part of human diet from ancient times. It can be defined as any fluid which is consumed by drinking. The term beverage is derived from French word 'Beivre' which means a drink.

A beverage or drink is a liquid intended for human consumption. Beverages are consumed mainly to quench thirst and compensate loss of body fluids. It consists of diverse group of food products, usually liquids that include the most essential drink, water, to wide range of commercially available fluids like fruit beverage, synthetic drinks, alcoholic beverage, milk, dairy beverages, tea, coffee, chocolate drinks etc.

Fig : 3.1 Beverages

Health Importance of beverages:

Beverages are essential for growth, development, provides health benifits and carrying out various physiological processes that are critical for living a healthy life.

- The water assists in digestion, assimilation and excretion of foods.
- It also helps in removing the toxic substances produced in body as a result of metabolisms such as urea, uric acid, ammonia etc.
- Water in beverages help in regulating the temperature of body through the process of sweating.
- Fruit and vegetable based beverages are source of micronutrients and antioxidants.
- Beverages like tea and coffee contain alkaloids which stimulate the central nervous system.
- Fermented dairy beverages are beneficial for improvement of gastro-intestinal health (Neutraceutical properties) due to probiotic bacteria.

3.1 CLASSIFICATION OF BEVERAGES

Beverages are broadly classified into the following groups:

- Non-alcoholic beverages
- Alcoholic beverages
- Soups

According to method of preparation they are of following types:

Non alcoholic beverages	Alcoholic beverages	Soups
• Fruit beverages • Vegetable beverages • Milk based beverages • Malted beverages • Carbonated (non-alcoholic) beverages • Tea and Coffee	• Fermented beverages • Distilled beverages	• Vegetable soup • Chicken or mutton soup

3.2 NON-ALCOHOLIC BEVERAGES

The term non-alcoholic beverages cover drinks that are either totally free from alcohol or that have less than 0.5 percent alcohol by volume. Non-alcoholic beverages includes following beverages:

1. **Fruit beverages:** Fruit beverages are one of the popular categories of beverages that are easily digestible, highly refreshing, thirst quenching, appetizing and nutritionally superior. This group includes beverages made from fruits. The fruit juice or pulp, are mixed with ingredients like sugar, acid, stabilizers, micronutrients and preservative to develop beverages and drinks. Various types of fruit beverages are as shown in the Table 3.1.

Table 3.1: Types of fruit beverages

Fruit beverage	Specifications
Fruit juice	This is natural, unaltered juice of a fruit.
Fruit drink	This is made by liquidifying whole fruit and at least 10% of the volume of undiluted drink must be whole fruit.
Fruit squash	This consists of strained fruit juice (25 %) + citric acid (1%) + preservatives with TSS (40-50° Brix) e.g. orange squash, mango squash etc.
Fruit cordial	It is clarified, sparkling, sweetend friut juice. e.g. lime juice cordial, with 25% juice + 1.5% citric acid + TSS (30° Brix) and preservatives
Fruit punch	A cocktail or combination of various juices (25%) + TSS (65° Brix)
Fruit juice concentrate	Concentrated form of juice from which water has been removed either by heating or freezing
Fruit syrup	Made of any single variety of fruit with 25% juice/ pulp + TSS (65° Brix) + 1.3-1.5% citric acid

Food Safety and Standards Act (FSSAI) has laid down the specifications for various types of fruit juice beverages including nectars are given below (Table 3.2).

Table 3.2 FSSAI specifications for same fruit beverages

Sr. No.	Name of the product	Fruit Juice/ Puree in final product (%) Minimum	Total soluble solids (°Brix) Minimum	Acidity expressed as citric acid, Maximum
1	Squash	25	40	1.0
2	Crush	25	55	1.0
3	Fruit syrups/ sherbets	25	65	1.5
4	Cordial	25	30	1.5
5.	Nectars	20	15	0.3

Flow chart: Preparation of fruit drink (RTS).

Ready to serve (RTS) is a fruit beverage which contain at least 10% fruit juice, 0.3% acid and TSS (10° Brix)

Mature ripe fruits
↓
Washing
↓
Blanching (if required)
↓
Peeling/ cutting/ stone/ peel removal
↓
Pulp/ Juice extraction
↓
Straining
↓
Juice weighing
↓
Preparation of syrup (sugar, water, etc.)
↓
Straining
↓
Mixing with pulp/ juice
↓
Addition of preservatives
↓
Bottling
↓
Capping
↓
Labelling
↓
Storage
↓
Sensory quality evaluation

Fig : 3.2 Fruit juice

2. **Vegetable beverages:** These are usually consumed fresh. They are used separately or as mixtures of various vegetables. Vegetables commonly used for extraction of juices are carrot, tomatoes, cucumber, bitter gourd, etc. They are used for therapeutic as well as culinary reasons. Vegetable juice is often mixed with fruits such as apples or grapes to improve the flavour.

3. **Milk based beverages:** Milk is a wonderful liquid food which imparts benefits to the young and the old alike. This class of beverages are more popular than others because of its high nutritional value. The primary ingredient of these beverages is milk to which many other constituents are added. It can be served hot or cold. Various milk beverages are-

- Milk shakes
- Flavoured milk

- Curd preparations (*Lassi*)
- Custards
- Sweets and desserts

4. **Malted beverages:** This class of beverage comprises of drinks which have malted grains as the main ingredient. The main advantage is that it enhances the nutritional value of beverage.

Do you know ?

A malt drink is a fermented drink, in which the primary ingredient is the grain or seed of the barley plant, which has been allowed to sprout slightly in a traditional way called "malting" before it is processed.

5. **Carbonated beverages:** Carbonated beverages are the one where carbon dioxide gas is dissolved in syrup or water. The presence of carbon dioxide creates bubbles upon release of pressure and fizzing in the beverage. The carbonated beverages are commonly referred as soft drink. Cola or lemonade beverages are typical examples of carbonated beverages. Soda water is another popular type of carbonated beverage which may also be flavoured.

6. **Tea and Coffee:** Tea and coffee is an important category of non alcoholic beverages that is already discussed in standard XI.

3.3 ALCOHOLIC BEVERAGES

Alcoholic beverage is a drink that contains ethanol, a type of alcohol produced by fermentation of grains, fruits, or other sources of sugar using yeast. Alcoholic beverages are classified on the basis of raw material and process technology used in their manufacture.

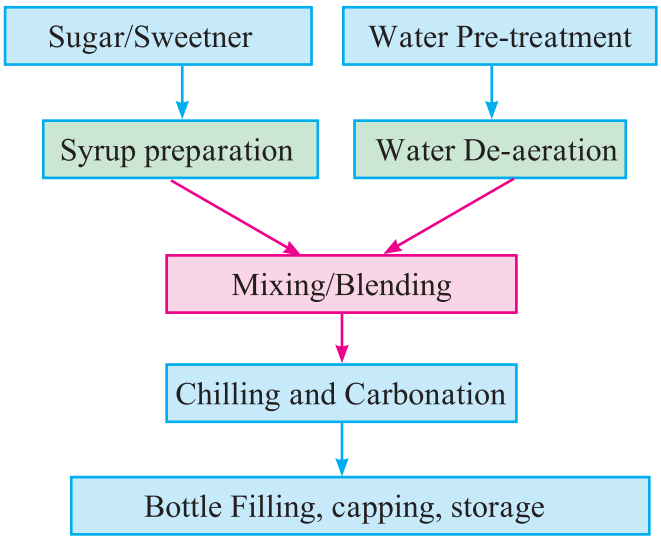
A. Fermentation: It is the process by which yeast converts sugar in grains or fruits into alcohol (ethanol) and carbon dioxide resulting in an alcoholic beverage.

$$\text{Sugar} \xrightarrow{\text{Yeast}} \text{Alcohol} + CO_2$$

The common types of alcoholic fermented beverages are beer and wine.

1. Beer:

Beer is an alcoholic beverage produced by fermentation of grains. Most commonly from malted barley, though wheat, maize (corn), and rice are also used. The starting material for the production of beer is barley malt (barley soaked in water and germinated)



Flow Process Chart of Carbonated Beverages

Do you know ?

Hops are the flowers (seed cones) of hop plants. They are used primarily as a fermenting, flavouring, and stability agent in beer.

Beer is produced by extracting raw materials with water, boiling (usually with hops), and fermenting. During fermentation process, starch (sugars) get converted into ethanol and CO_2 gas in the resulting beer. Beer contains about 4-5% alcohol.

2. Wine:

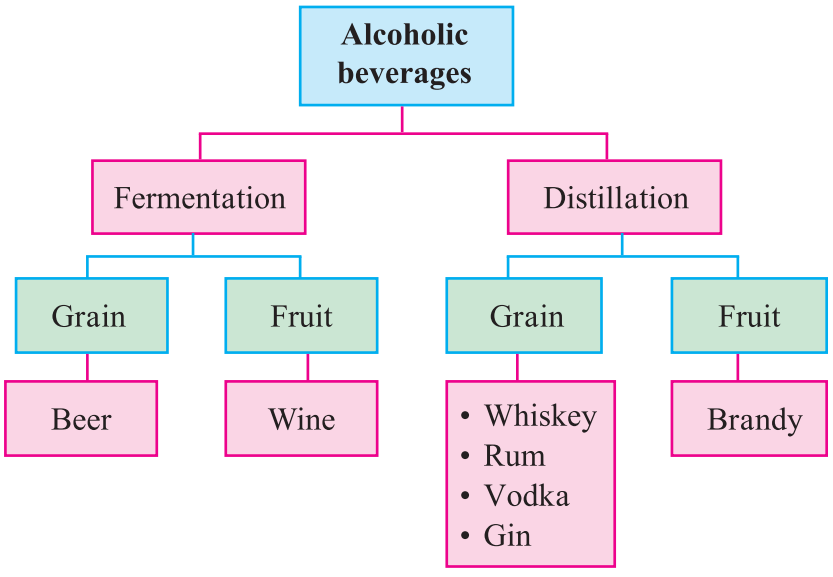
Wine is an alcoholic drink fermented by yeast cells present on grape berry. Yeast consume the sugar in the grapes and converts it to ethanol, carbon dioxide, and heat. Wines are also made from juices of other fruits and berries. Cider is fermented apple juice. Most of the natural wines contain 8-10 % alcohol.

B. Distillation (distilled liquors/spirits):

The distillation of alcoholic fermented beverages is carried out to remove diluting components like water. The liquid obtained by fermentation contains dilute alcohol and concentrated by distillation. Distilled liquors or spirits are made by distilling fermented liquors. Distilled liquors usually have 40% alcohol and they have excellent keeping qualities. Some of the alcoholic beverages belonging to the category of spirit are listed in Table 3.3.

Table 3.3 Alcoholic beverages belonging to category of spirit

Alcoholic beverage	Base material	Alcohol content by volume
Brandy	Fruit Juices mainly grapes	35-60%
Rum	Molasses or sugarcane juice	40-55%
Whisky	Cereal (Barley, corn malt)	40-55%
Vodka	Malted cereals, potatoes etc.	38-40%



Types of Alcoholic beverages

3.4 SOUPS

Soups are important beverages and are generally served as a starters before any meal. They can be vegetarian or non-vegetarian.

Soup is a primarily liquid food generally served warm or hot (but may be cool or cold), that is made by combining ingredients of fruits, vegetables or meat with stock or water.

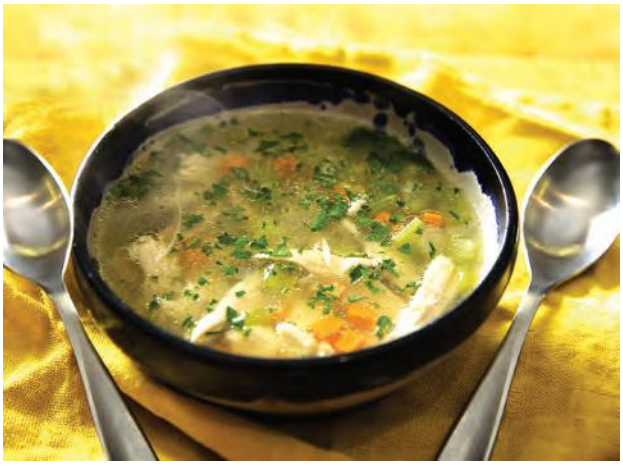


Fig : 3.3 Soup

Importance of soup:

- Good sources of fluids of fruits and vegetables
- Aids in digestion
- Stimulates appetite by increasing the flow of digestive juices.
- Healthy and nutritious
- Rich in taste
- Rich sources of fibres and minerals

Classifications of soup: Soups are of various kinds like-

1. **Clear soup:** Clear soup is a soup that is made by simmering vegetables and / or meat in a liquid until all flavours are released. These soups are clear and are great for those on a liquid diet.
2. **Thick soup:** They are usually a puree of vegetables thickened with starch. They contain fruits and vegetables pieces, macaroni or noodles, etc.
3. **Cream soup:** They are popular modifications of thick soups with a little amount of cream added to the soups.

3.5 OTHER BEVERAGES

There are other categories of beverages like herbal drinks, energy drinks and sports drinks.

Herbal drinks:

Herbal drinks are prepared by using the infusion of herbs in water. A wide variety of herbs such as aloe vera, ginseng, *shatavari*, *Arjuna*, lemongrass, thyme etc. may be used for as base material for herbal drinks.

Fig : 3.4 Herbal drinks

Energy Drinks:

An energy drinks is a type of drink containing stimulating compounds usually caffeine, which is marketed as providing mental and physical stimulation (marketed as "energy", but distinct from food energy). They may or may not be carbonated and may also contains sugar, other sweeteners, herbal extracts, taurine and amino acids

Sports drink:

These are also called as electrolyte drinks which are basically designed to replenish the loss of fluid and electrolytes and provide quick energy during the exercise and sports activity. There are three types of the sports drinks which contain various levels of fluid, electrolytes, and carbohydrate.

- Isotonic drinks have 6-8% carbohydrate.
- Hypotonic drinks have a low level of carbohydrates.
- Hypertonic drinks have high levels of carbohydrates.

3.6 COMMON EQUIPMENTS USED IN BEVERAGE PREPARATION

A complete juice processing line is composed of fruit sorter, washer, blancher, crusher/ pulping machine, juice extractor, concentrator, sterilizer/ pasteurizer, filler, bottling, etc. As for different fruits, the production processes are varied.

Fruit sorter:

The fruits are gently carried through high precision systems to be weighted. Fresh fruit and vegetables are then examined by graders and sorting systems according to external (colour, skin defects, etc.) and internal quality such as hardness measurement, brix (degrees), ripeness, damage/ bruise of the pulp, etc.

Fig : 3.5 Fruit sorter

Fruit washing:

There are many ways to wash and clean fruits and vegetables before juicing them. Washing fruits or vegetables properly can help to get rid of some of the pesticides, insect residues, and other unnecessary chemicals that can sometimes be found on them.

Fig : 3.6 Fruit washing

Blancher:

Blanching is a process of deeping of fruits and vegetable in boiling water (>88° C) for few seconds/ minutes so as to destroy the enzymes and reduce the microbial load along with residuals, insecticides and pesticides. It also help in softening of tissues, texture and fixing the colouring pigments.

Fruit Pulper:

Fruit pulper is an ideal machine for extracting pulp of fruits like tomatoes, mangoes, raspberry, papaya, pineapple, *jamun*, etc. During the processing, the seeds and skin get separated and discharges through an outlet. The separated pulp is conveyed to the next processing step.

Fig : 3.7 Fruit pulper

Juice extractor:

A juice extractor is a machine that mechanically separates juice from the solid part (pulp) of most fruits, vegetables, leafy greens, and herbs. Most juice extractors are electric operated, which requires less effort than their manual process. The raw material is put into the machine, where juice is separated from pulp and then it is filtered and collected in a container.

Fig : 3.8 Juice extractor

Fruit juice pasteurizer:

Pasteurization is used to kill any contaminating pathogens that might be contained in the raw juice. Here, the product is heated up to pasteurization temperature, maintained at this temperature for the required time, then rapidly cooled down to the temperature for filling, in aseptic conditions. The pasteurization temperature and time will vary according to nature of product.

Fig : 3.9 Pasteurizer

Concentrated/ Steam jacketed kettle:

Steam jacketed kettle are used for concentration of fruit juices by using energy as heating source. Concentrated products are thickened by evaporation of moisture and increasing total soluble solid, thereby shelf life of the product is drastically increased.

Fig : 3.10 Steam jacketed kettle

Deaerator:

Vacuum degasser is also known as vacuum deaerator/vacuum degasifier. It is used to eliminate the air (oxygen) in fruit juice, milk and other drinks. Degassing can inhibit the browning and the oxidation of pigment, vitamins, fragrant component and other substance, so as to preserve the drink quality, and prolong shelf life.

Fig : 3.11 Deareator

Automatic fruit juice filling/packing machine:

Juice filling machine can perform bottle washing, filling and capping processes automatically. It applies to juice, mineral water, and other drinks, including drinks containing gas. It can be used for filling different type of bottles, such as PET bottles, plastic bottles and glass bottles.

Fig : 3.13 Fruit juice filling unit

Points to remember

- Beverages are essential for growth, development and carrying out various physiological processes that are critical for living a healthy life.
- The term non-alcoholic beverages cover drink, that are either totally free from alcohol or that have less than 0.5% alcohol by volume.
- Alcoholic beverages is a drink that contains alcohol
- Soup is a primarily liquid food generally served warm or hot (but may be cool or cold), that is made by combining ingredients of fruits, vegetables or meat with stock or water.

Exercise

Q. 1 a. Select the correct option from given choices.

i. Milk based beverage is an example of _____ .
a. Non alcoholic beverage
b. Alcoholic beverage
c. Soups
d. Carbonated drink

ii. Beverages are called carbonated due to presence of _____ gas.
a. Oxygen c. Carbon dioxide
b. Nitrogen d. Hydrogen

iii. While preparing fruit juice, we should select
a. Unripe fruit
b. Mature and ripe fruit
c. Overripe fruit
d. Decayed fruit

iv. Beer is an example of _____.
a. Fermentation of grain
b. Distillation of fruit
c. Distillation of grain
d. Fermentation of fruit

v. By Distillation process, the alcohol content in the beverage is _____.
a. Concentrated c. Removed
b. Decreased d. Remains same

b. Match the correct pairs.

A		B	
i.	Flavoured milk	1.	Distillation
ii.	Deaeration	2.	Fermentation
iii.	Rum	3.	Fruit pulper
iv.	Beer	4.	Removal of air and gases
v.	Soup	5.	Milk based
		6.	Healthy and nutritious

c. Do as directed.

i. Write true or false.

Fruit juice is natural unaltered drink.

ii. By considering the first correlation complete the second correlation.

Non alcoholic beverage: Fruit beverage

Alcoholic beverage : _____

iii. Identify the odd word.

a. Fruit beverage
b. Vegetable beverage
c. Malted beverage
d. Soup

iv. **Name the word with the help of clue:**

Clue: It is a slight alcoholic drink usually made up of grapes and sometimes other fruits.

	I		

v. **Who am I ?**

....., extracts tomato juice

Clue: I am a machine that mechanically separates juice from the solid part (pulp) of most fruits, vegetables,

Q. 2 Answer the following questions briefly.

i. Define beverage.

ii. Draw the table of classification of beverages.

iii. Give the flowchart of preparation of carbonated beverages.

iv. Explain deaeration.

v. Name the equipments used in preparation of fruit juice.

vi. Give the classification of alcoholic beverages.

vii. List the classification of soup.

Q. 3 Write short notes on.

i. Explain process of preparation of fruit drink.

ii. Explain the distillation process or distilled liquors.

Q. 4 Long questions.

i. Explain any three equipments used in preparation of fruit juice in detail.

ii. Explain beer processing in detail.

Projects:

Select any ten recipes and make an album based on various types of beverages.