BEVERAGES AND APPETISERS

A beverage is composed chiefly of water used as a drink for the purpose of relieving thirst and introducing fluid to the body, nourishing the body, and stimulating or soothing the individual.

CLASSIFICATION

Beverages may be classified according to their function in the body. A particular beverage may have more than one function.

Refreshing	:	Water-plain, carbonated beverages not containing fruit juices; fruit juices; iced tea and butter milk with salt and lime juice.
Nourishing	:	Milk—pasteurised, skimmed, evaporated, dried, malted; butter milk, chocolate and coco; milk shakes; Eggs—egg nogs made with whisky, rum, brandy, fruit juices, coffee and chocolate; fruit juice; glucose, lemonade.
Stimulating	:	Egg nogs made with whisky, brandy, coffee; coffee or tea and cocoa or chocolate beverage.
Soothing	:	Warm milk and hot tea.
Appetising	:	Soups, fruit juice and alcoholic drinks in limited quantity.

COFFEE

Coffee is an important beverage used all over the world. Brazil is the largest coffee producing country in the world although some of the choicest grades are produced in Arabia, Java and Venezuela. The bulk of coffee grown in India is coffee arabica, the main centres of production being Tamil Nadu, Karnataka, Kerala and Orissa.

The coffee plant

The coffee plant grows 6-20 feet high depending on the species, area of growth and local custom of pruning. In India the plant is kept pruned down to a height of 4-5 feet.

The evergreen coffee plant bears white flowers which give place to a fruit which resembles a small cherry with dark red purple cover. The fleshy mucilaginous pulp of the fruit encloses two oval greenish grey seeds or beans. Each covered by a thin membrane, the silver skin. Both seeds are enclosed in a common husk-like membrane or parchment. The ripe beans are used for coffee beverage.

Figure 12-a and b show coffee berries and the cross section of berry.

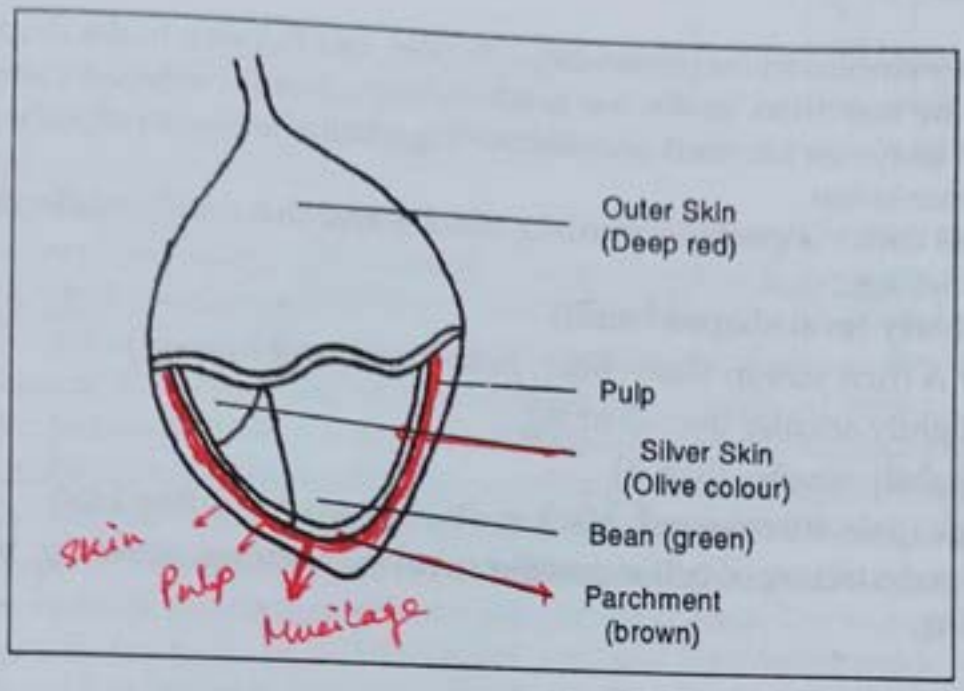

Figure 12-b: Cross-section of coffee berry.

Figure 12-c gives steps involved in dry and wet method of curing process.

Processing

Coffee processing consists of removing the skin, pulp, parchment and silver screen. The quality of the final product depends upon the manner of processing.

It is the curing process that prepares the coffee beans for market. Two

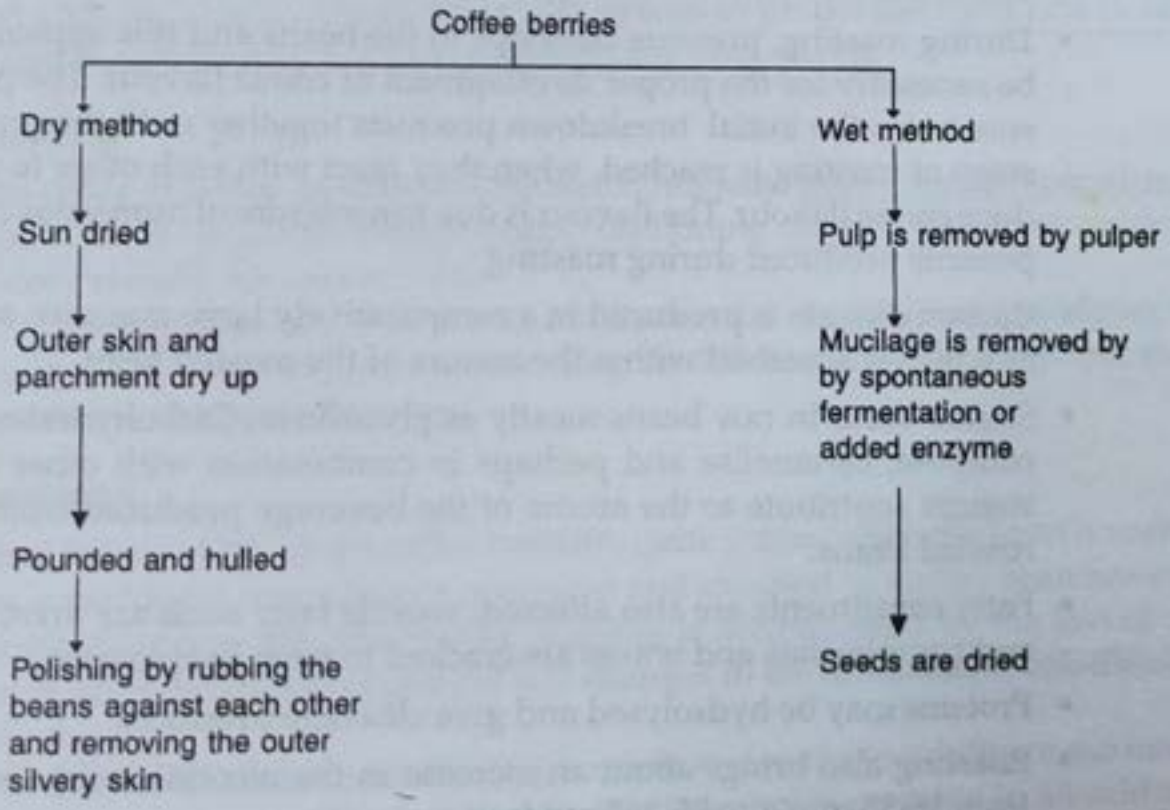

Figure 12-c: Coffee curing process

methods are employed for processing—the dry and the wet. In the dry method the beans are sun dried. In the wet method, known as the washed coffee process, pectin enzymes are used on selectively picked cherries to replace spontaneous fermentation.

Cured coffee is graded according to sizes and shapes. The different plantation grades are:

Pea berry (oval-shaped beans)

O or A (first size in flats—bold, heavy and well formed)

B (slightly smaller than O or A)

C (slightly smaller than B)

Triage (pale, discoloured, black spotted beans including bits)

The manufacture of coffee powder involves roasting, grinding, blending and packing.

Roasting

Raw or green coffee does not have flavour or aroma and has an unpleasant taste. During roasting many physical and chemical changes occur.

- The beans swell in size to almost double their original size.
- The dull green colour changes to brown.
- Water is driven off and loses 12-25% of its weight.
- A slight loss of caffeine takes place as chlorogenic acid splits up to caffic and quinic acids.
- The beans lose their hard horny structure and become brittle.
- During roasting, pressure develops in the beans and this appears to be necessary for the proper development of coffee flavour. The pressure holds the initial breakdown products together until the proper stage of roasting is reached, when they react with each other to produce coffee flavour. The flavour is due to a mixture of numerous components produced during roasting.
- Carbon dioxide is produced in a comparatively large quantity, some of which is absorbed within the texture of the roasted bean.
- Sugars occur in raw beans mostly as glycosides. Carbohydrates decompose, caramelise and perhaps in combination with other substances contribute to the aroma of the beverage produced from the roasted beans.
- Fatty constituents are also affected, volatile fatty acids are driven off and complex fats and waxes are cracked to form simple ones.
- Proteins may be hydrolysed and give cleavage products.
- Roasting also brings about an increase in the nicotinic acid content from 16-55 mg/g to 95-263 mg/g.
- Small quantity of furfuraldehyde is formed.

The roasted product is spread out for cooling either on iron or wooden platforms and fanned for 10-15 minutes. The cooling must be quick in order to preserve the flavour and aroma and the keeping quality. Surface cooling closes the pores and seals the berry.

The flavour and aroma of coffee are best when it is freshly roasted and deteriorate on standing. The flavour is largely due to 2-thiofuran and its methyl and ethyl esters, together with some other sulphur compounds. The manner and extent of roasting affects the extraction of caffeine in the liquor.

Among the identified components of the volatile oil present in roasted coffee are acetaldehyde, furan, furfuraldehyde, furfurly alcohol pyridine, hydrogen sulphide, diacetyl sulphide, acetyl propionyl, acetic acid, guaiacol, vinyl guaiacol, pyrazine, n-methyl pyrrole and methyl carbinol. Although the aroma is partly due to some of the constituents of the volatile oil, it is probable that less volatile substances also contribute for flavour. For example, phenolic decomposition products of chlorogenic acid and the condensation products of phenols and aldehydes, are responsible partly or substantially for the aroma. The aroma of coffee is partly attributable to mercaptans present in the roasted beans.

Grinding

The bulk of roasted beans is ground to powder and sold as ground coffee. Roasted beans are ground to three sizes, namely, fine, medium and coarse. Coarse ground powder retains aroma and flavour better and longer than fine ground powder. Coarse ground powder is more suitable for preparing coffee decoction by percolation. On the other hand, fine ground coffee gives a decoction with high body. A mixture of both grades in proportion 90 of fine to 10 of coarse is said to give a liquor with excellent cup-quality.

Blending

Two types of coffee powder are marketed, namely, pure coffee prepared from coffee beans only and French coffee containing chicory. The proportion of chicory should not exceed 50%.

Strength, flavour, aroma and acidity are the chief criteria in judging the quality of coffee and judicious blending of different grades brings out these qualities to the best advantage.

Staleness

Constituents of the green coffee bean are quite stable, when the bean is roasted this is no longer true. Once it is ground and exposed to air the bean has even a limited storage life. The staling of coffee is accompanied by the loss of carbon dioxide, oxidation of guaicol and changes in the unsaturated volatile compounds.

The staleness in roasted coffee is attributed to the instability of the mixed volatile constituents. The fact that furfuryl alcohol is unstable in an acid medium suggests that this and possible other non-fatty constituents present in roasted coffee are responsible for staleness. Furfuryl alcohol which is present

in freshly roasted coffee is not present in the infusions of stale coffee.

Staling is not due to the rancidity of the oil, but is probably the combined effect of volatilisation, polymerisation, hydrolysis and oxidation of the flavour constituents.

Freshness of ground coffee is maintained commercially by sealing it in a container under vaccum. Storing the grounds in a cool place will delay staling. Even more detrimental to freshness than heat is moisture. Once a can of coffee is opened contact with moisture should be kept to a minimum.

Coffee substitute

Chicory root is chopped, roasted and ground and is used as a substitute for coffee often blended at 50% level. It gives bitterness and body to the beverage which some people find refreshing. It is not harmful to the body. It produces a dark infusion with laxative properties and does not have caffeine.

Adulterants of coffee

- If chicory is added and not mentioned on the label, it is considered as adulterant.
- Cherry husk is sometimes used as an adulterant.
- Burnt sugar, tamarind seed, used coffee powder and saw dust are also used as adulterants.

Many of the adulterants can be easily detected by microscopic examination. Other tests employed are: determination of aqueous extract, sugar (high for the usual adulterants), fat and caffeine (low for adulterated products). The ash of coffee is practically free from silica, while that of the common adulterants contain silica.

Pure coffee extract has a lower density than the extracts of adulterants including chicory. When a few grains of the chicory containing sample are placed in water, a brownish cloud is observed, which diffuses through the water. Pure coffee does not give any colouration. Chicory readily sinks in water. The percentage of water soluble matter in chicory is 21-35%, while that in coffee is 75-85%.

Coffee beverage

Coffee is used mainly as a beverage in the form of aqueous extract prepared from roasted and powdered beans. Coffee has no food value. The constituents that are of chief significance in the making of the beverage are caffeine, flavour substances and bitter substances.

Caffeine: It is an alkaloid substance producing the stimulating property. Caffeine stimulates the central nervous system, especially the part associated with physical functions. It increases the capacity for physical exertion. It is also a cardiac stimulant. It is a diuretic. It is addiction forming. It is bronchodilater. It increases gastric acid and pepsin secretion.

The longer the brewing time of coffee the more is caffeine extracted. It can be removed chemically from the bean to produce decaffeinated coffee.

Flavour substances: It is the sulphur compounds that are the main contributors to the flavour. The precursors of the flavour and aroma are water soluble or water dispersible. The flavour substances are volatile. Too long heating and too high a temperature may destroy all characteristic flavour and aroma.

(a) Chlorogenic acid contributes some body and astringency to coffee beverage and its decomposition yields some of the minor component of aroma.

(b) Sucrose decomposition besides giving colour also contributes to aroma and sourness.

(c) Crude protein fractions of the bean seem to be the major precursors of aroma.

Bitter substances: Polyphenol substances or tannins are hot water soluble. Hence longer the coffee is brewed, the greater will be the tannin content and the bitterness becomes pronounced.

Good coffee can be made by using pots made of glass, earthen wear or enamel wear, soft water and brewing at 85-95°C.

Methods

Good coffee can be made by several methods but the two principles to be considered are:

1. The control of method in order to avoid loss of flavour substances.
2. The extraction of desirable amounts of bitter substances.

Two level measuring table spoons are added to 3/4th cup of water in making coffee. If a weaker brew is desired hot water can be added after the coffee has been made at full strength.

Figure 12-d, e and f show different methods of making coffee.

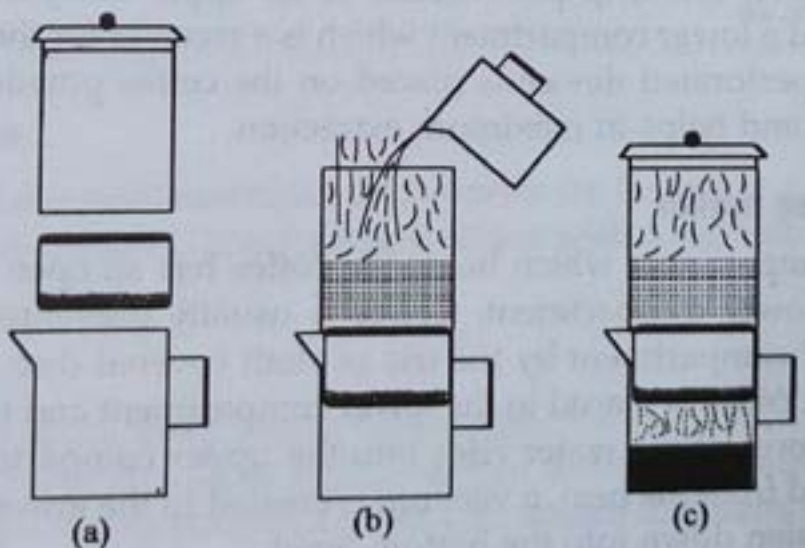

Figure 12-d : The drip method

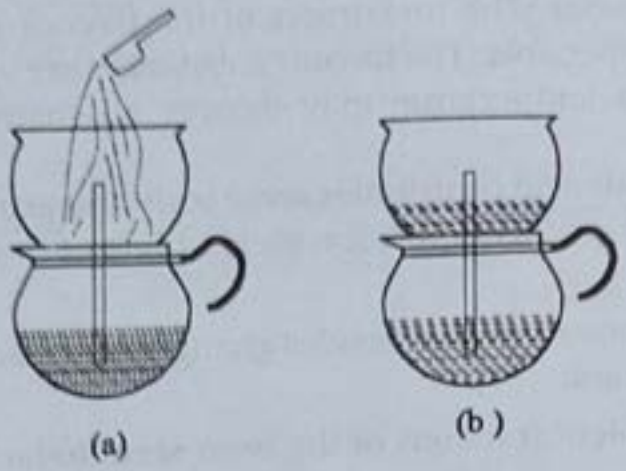

Figure 12-e : The vacuum method

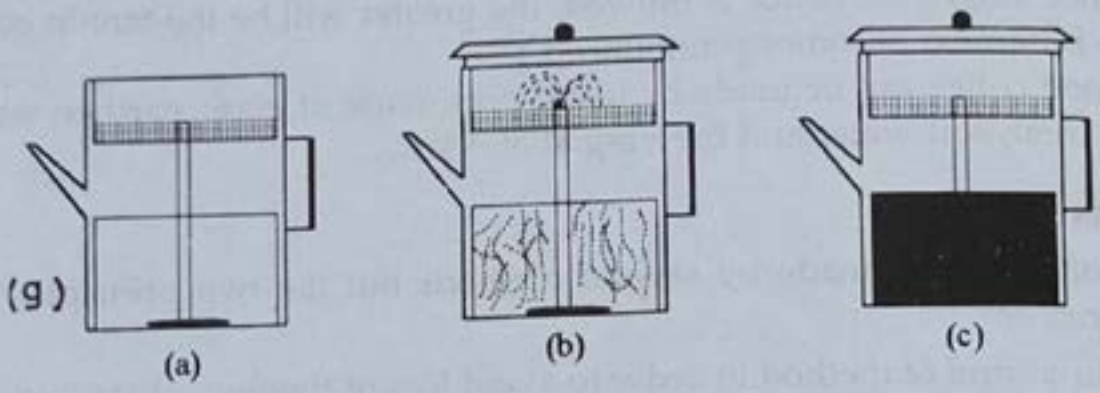

Figure 12-f : The percolation method

Source: Pekham, G.C., Jeanne H. Freeland-Graves, 1979, Foundations of food preparation, Macmillan Publishing Co, Inc, New York.

Filtration

By this method water filters through the coffee into a lower compartment of the coffee maker. The drip pot consists of an upper compartment which is perforated and a lower compartment which is a receiver for the filtered beverage. A small perforated device is placed on the coffee powder of the upper compartment and helps in maximum extraction.

Vacuum coffee maker

The upper compartment which holds the coffee has an open tube which extends to the lower compartment. Coffee is usually prevented from passing into the lower compartment by the use of cloth covered disc placed over the tube opening. Water is placed in the lower compartment and the pot is heated until almost most of the water rises into the upper compartment. When the pot is removed from the heat, a vacuum is created in the lower bowl, drawing the clear infusion down into the bottom bowl.

Percolation

Here the heated water is forced upwards through a tube on to the coffee

compartment. The grounds (regular) are kept in the perforated coffee basket. There is a dome at the lower end of the tube which extends from the top of the percolator. The tube supports the basket. Steam exerts pressure on the surface of the water under the dome, forces the water up the tube on to the coffee. Percolation time which depends upon the speed of circulation varies from 8-15 minutes.

Steeping

Water is heated and just before it reaches boiling point medium ground coffee powder is added. Steeping time is about 6-8 minutes. The coffee is then passed through a strainer. During steeping the coffee pot should be lightly covered to prevent losses of flavouring compounds.

Table 12.1 summarises different methods of making coffee.

Table 12.1: Methods of coffee making.

Method	*Flavour*	*Tannins*	*Limitations*
Filtration	Retains well	Extracts less	Decoction may not be hot
Vacuum coffee maker	Retains well	Extraction is more due to the contact with the grounds at a high temperature for few minutes.	More bitter
Percolator	Loss of flavour due to constant aeration of the brew as the liquid is forced up and sprayed the grounds.	Extraction is more due to recirculation of hot water through the coffee grounds.	More bitter
Steeping	Retains best	Extracts less	Extraction of flavour may not be complete

Espresso coffee

This is made by a special machine which brews the beverage a cup at a time. It is derived by a brewing finely ground coffee with a mixture of steam and hot water.

Soluble coffee

Soluble coffee is spray dried strong coffee brew. Or it can be made by freeze drying. Soluble coffee should be kept packaged in water and air-tight containers because they are hygroscopic and tend to absorb moisture.

Decaffeinated coffee

By a chemical process most of the caffeine can be removed from the beans to give decaffeinated coffee which has good flavour.

TEA

Tea is grown in China, Japan, Java, Sumatra, Ceylon and India (Assam, Darjeeling, Coimbatore, Nilgiris and Cochin).

Tea is a beverage prepared by pouring boiling water over dry processed leaves. It is the most popular refreshing drink in many countries. India tops the list in production and export of tea. Tea comes from a tropical evergreen tree 'camellia' and it belongs to the family 'theaceae'. There are about 45 species of camellia of which camellia sinensis is considered important. It is a fast growing variety with large drooping leaves and the yields are higher.

Tea plant under cultivation is usually pruned down to a height of 2-5 feet and maintained as a bush. Tea harvesting consists in collecting the flush, that is, newly grown vegetative shoots composed of the terminal bud and two or three leaves immediately below it together with the intervening stalk.

Fresh tea leaves also contain carotenes, riboflavin, niacin, pantothenic acid and ascorbic acid. But during manufacture of black tea they are lost. No change takes place in green tea as its manufacturing does not involve fermentation.

As only tea infusion is consumed, it does not contribute to the nutritive value. The proteins present in tea leaves are rendered insoluble in the processing. Tea infusions contain negligible quantities of carbohydrates and fat. What nutritive value tea has comes from added milk and sugar. Tea as a beverage is consumed for its stimulating effect.

The important constituents of tea contributing to the flavour are caffeine, polyphenols and essential oils.

TYPES OF TEA

There are three types of tea depending on the processing of tea leaves. They are black, green and oolong. Any size of leaves may be made into any type of tea. Black tea is the most popular among the three.

Black Tea

Various processing steps involved in the manufacture of black tea are withering, rolling, fermentation, drying, grading and packing.

Withering: It is carried out by spreading tea leaves thinly on racks or shelves. Air is blown to make them soft and flexible. They are dried till the moisture content is lowered to 40 per cent. It takes 16 to 24 hours for the leaves to wither to the required degree.

Rolling: The withered leaves are then rolled to break open the cells and release the juices and the enzymes. Various rolling techniques are employed for rolling. The flavour characteristic inherent in various teas partially depend on the technique used. Crushed, torn and curled machines have replaced the traditional rolling machines.

Fermentation: After rolling the leaves are spread out thinly on suitable platforms and allowed to ferment for 2-6 hours at temperature between 21 and 27°C. During fermentation polyphenol substances also called tannins are

oxidised and some new phenolic products result. Two of the important polyphenols that undergo oxidative changes are catechin and gallocatechin. The colour of the leaves changes to black. Enzymatic browning which is desirable takes place. The beverage made from black tea is less bitter and astringent than green tea and it has a rich aroma and flavour. When the fermentation has proceeded to the desired degree further change is arrested by drying and firing.

Drying or firing: The fermented leaf is passed through the drier. The leaf is dried at 87.7-93.3°C for 30-40 min. The dried product contains 3-4% moisture. Besides halting the fermentation process the firing causes some caramelisation.

Sorting and grading: Grading of tea is done according to its size. Whole leaf grades are as follows:

Orange pekoe: Long, thin leaves that are closely twisted, yellow leaf tips and bud leaves are sometimes included.

Pekoe: Small tightly rolled leaves together with some open leaves.

Souchang: The largest and coarsest of the whole leaf grade.

Broken is graded as Broken Orange Pekoe, Broken Pekoe, Souchang and Fannings. Small fragments of broken leaves, like dust are called Fannings. Broken grades usually give a stronger tea and quicker extraction than leaf grades.

Blending: Different teas are blended to produce a product with uniform character. Blending is an art and demands skill and experience.

To obtain best tea each tea company employs tea tasters who select only certain teas for purchase. These teas after being blended by the company have a flavour for which the firm is known.

Packing: In India, the blended tea is packed in plywood boxes lined with aluminium foil and parchment paper.

Green Tea

Green tea is produced in Japan. Here withering and fermentation are completely omitted. It is made by first steaming the leaves to prevent the leaves from changing colour and to inactivate the enzymes. Steaming is then followed by rolling and drying. The leaves retain much of its original green colour especially the finer leaves. The older leaves often have a blackish gray colour.

The beverage made from green tea has a greenish yellow colour and is distinctly bitter and astringent. It has little aroma and flavour as compared with black tea because the preliminary steaming destroys the enzymes that produce flavour substances during fermentation of black tea. The caffeine content is also higher.

Oolong Tea

This has special market in America and almost exclusively produced in Borneo. Oolong tea is partially fermented. The fermentation period is too short to change the colour of the leaf completely. It is only partially blackened. The beverage is intermediate between those produced from green and black teas.

Colour of Tea

The bright orange colour in black tea beverage is due to theaflavin which together with caffeine contribute briskness to the beverage. A second group of substances which appear in fermented tea are thearubigins and they contribute the rusty brown colour to the beverage. Theaflavins give brightness and sparkle to tea and thearubigins the depth of colour. As fermentation proceeds thearubigins increase at the expense of theaflavins. The concentration of phenolic substance is the most in the bud and the first leaf of the harvested tea. The high phenolic content gives a tea with a high colour.

Preparation of Tea

A good cup of tea is sparkling clear and have maximum flavour with minimum ployphenol compounds which contribute to the bitterness. In order to obtain this, water used in making tea should be fresh and soft. If water is hard the dissolved salts form an undesirable precipitate with polyphenols and this will present an unattractive film that floats on the surface of the tea. The water should be freshly boiled but should still contain sufficient oxygen to give the tea a fresh pleasant odour. Metallic tea pots impart metallic flavours. It is best to use china, glass or earthen wear. The pot should be covered with the lid which helps to retain heat and prevents the escape of volatile compounds. Flavour substances and caffeine are readily extracted by short infusion periods. A steeping period of about 3 minutes gives a stimulating but not astringent beverage.

Factors affecting the quality of tea

- The polyphenol and the enzyme content of leaves used in processing affects the quality of tea. They are maximum in buds and the first and second leaf and the tea obtained from these is most desirable.
- The finest tea comes from higher elevations of 900-2100 meters.
- Mechanical pluckers are common in countries with flat land but tea of high quality are generally produced from leaves that have been hand plucked.
- Soil in which the plant is grown.
- Best tea comes from plants grown at low temperature where the air is warm.
- Processing techniques used.
- Orange pekoe has the largest leaves and in the best quality.

Table 12.2 gives caffeine content in various beverages.

Tea Taster

The value of tea as a beverage is determined by the chemical analysis and the comprehensive examination by the tea taster.

Table 12.2: Caffeine content in various beverages

Beverage	Volume ml	Caffeine mg.
Cola drinks	300	20-35
Brewed coffee	180	100-150
Instant coffee	180	60-80
Tea	180	40-100

Source: Pulkit Mathur, Caffeine dependence—a storm in a tea cup, *Nutrition*, 29, 4, 1995.

The taster first examines the sample of the dry leaf for its complexion, style, evenness of size and stalk and fibre content. Good tea should have a uniform black colour with a sheen and the presence of fibre is not desirable as it is generally the result of improper or coarse plucking of the leaves. He also feels the leaf to see if it is crisp, indicating proper firing as opposed to a spongy feel.

The infused leaf gives an indication of the merit of the liquor and a bright and coppery infusion is the ideal one. The taster then looks at the liquor to assess its colour, takes a sip, swirls it in the mouth for a few seconds and spits it out. By doing so, he judges the strength, body, briskness and also the finer aspects like quality, flavour and character. Sometimes milk is added to judge the colour and strength more accurately.

The strength of the liquor is thickness and gives a good indication or the number of cups of tea that can be prepared from 1kg. Briskness is the liveliness in a liquor and brisk tea have good keeping qualities.

After examining, he recommends how much the tea is worth, in both quality and price. These recommendations are helpful guidelines for the prospective buyers at the tea auctions.

Effect of acid on black tea

Colour of black tea beverage is influenced by the hydrogen ion concentration in water. Thearubigins in tea brew are weak acids which ionize. The anions are highly coloured. If acid is added to tea the hydrogen ions depress the ionization of thearubigins which makes the beverage paler in colour. This accounts for the effect.

Cloudy tea

Under certain conditions tea beverage becomes cloudy or turbid. Formation of complex between caffeine, theaflavins and thearubigins is believed to be responsible. The caffeine carries a positive charge and thearubigins carries a negative charge. When the concentration of the two is high a precipitation forms. The stronger the tea, the more likely the complex to form. Iced tea also is more likely to become cloudy than hot tea. This complex can be broken by the addition of hot water or an acid to the beverage.

Instant tea

Instant tea is made by brewing tea on a large scale and then removing water by a drying process. The powdered tea combines easily with moisture and so is packed under controlled humidity and temperature. Instant tea at home is made by adding water to the powder. However flavour and aroma of instant tea is less full than that of the beverage prepared from tea leaves.

Spiced tea

Spiced tea is made by adding cardamom, ginger, cloves, pepper, mint, tulsi leaves or cinnamon.

Biotea

The has been developed by the University of Agricultural Sciences, Bangalore. It is prepared by aerobic fermentation of tea decoction containing 10% sugar by two selected micro-organisms, namely, a yeast (*Candida T. strain*) and a bacterium (*Aceto bacter T. strain*) for 3 to 5 days. These grow into a symbiotic association forming a leathery looking, slimy, gelatinous sheet (pellicle) on the surface of tea decoction. The fermented tea decoction after removing the pellicle is pasteurised and stored in juice bottles for regular drinking as Biotea. This tea can be consumed cold without milk. It is a refreshing drink. It tastes and smells like a natural fruit juice.

Adulteration

The commonest adulterants are spent leaves, grit and sand. Lime is sometimes added to increase the colour of the infusion from inferior tea. Leaves of other plants like agathi, avaral and husk of black gram are used as adulterants.

The total ash content of tea varies from 4 to 7% and the soluble ash is not less than 50% of the total ash. Adulteration with spent leaves reduces both the total ash and soluble ash contents while grit, sand or lime increases the total ash content and reduces the percentage of soluble ash.

Table 12.3 shows PFA standards for coffee, tea and chicory.

Table 12.3: PFA standards for Coffee, Tea and Chicory

	Coffee	*Tea*	*Chicory*
Aqueous extract %	26.0 to 35.0	32.0	50.0
Total Ash %	3.0 to 7.0	4.0 to 8.0	3.5 to 10.0
Acid insoluble ash %	0.1	1.0	2.5
Water soluble ash %	65.0	40.0	–

COCOA AND CHOCOLATE

Cocoa and chocolate are made by grinding the seeds of the pods of the cacao

tree (theobroma cacao) which is indigenous to Central America and is grown extensively in Brazil, West Indies and Sri Lanka.

Figure 12-g: Cacao tree with pods. Pods contain cacao seeds.

Source: New Larousse, 1983, Gastronomique—The world's greatest cookery reference book, Prosper Montague Publishing group Ltd., Hamlyn, London.

The Brazilian beans are considered to be the best. The pods are 4-7 inches in diameter having thick leathery rings containing 25-75 seeds inside in rows. The seeds are embedded in a white or pinkish pulp and possess excellent aroma and flavour.

Processing

Different steps are involved in the processing of cacao beans. Figure 12-h gives flow chart of cocoa and chocolate manufacturing plant operations.

Fermentation

The cacao pods after harvesting are cautiously opened. The beans and the mucilage are scooped out and subjected to natural fermentation. They are piled in heaps in perforated wooden boxes for a period of 3-12 days depending on the type of the bean. The heat produced during fermentation raises the temperature of mass to about 45-60°C. The fermentation is complete when the temperature of mass begins to fall. At the end of fermentation the pulp breaks down and there is change in the colour of seeds from pale yellow to violet to brown. The endogenous enzymes activated by the heat of fermentation brings about the changes in proteins and polyphenols in the kernels. And there is also reduction in the astringency of the kernel.

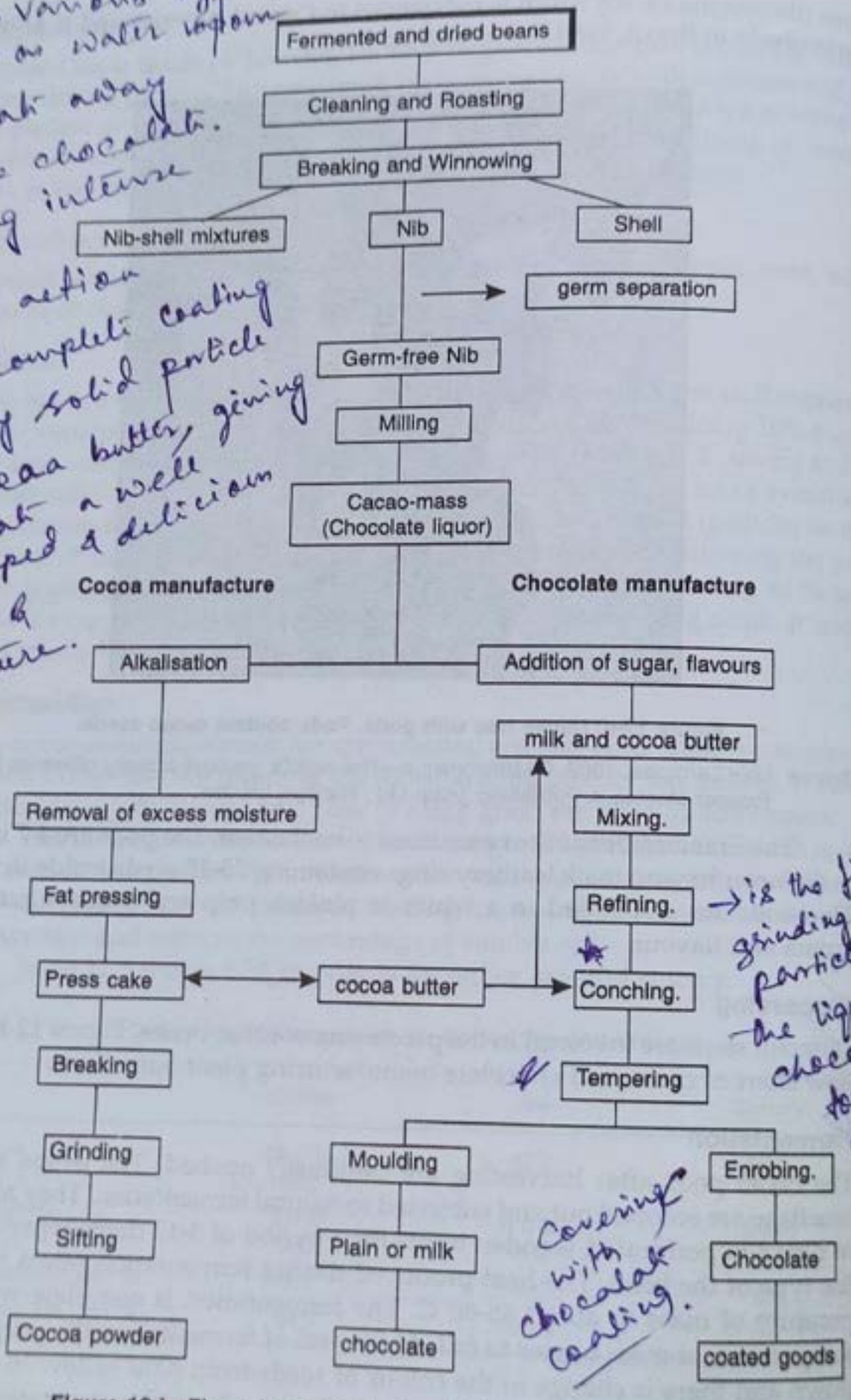

Figure 12-h: Flow chart of cocoa and chocolate manufacturing

Source: Potter, N.N., (1978) *Food Science* CBS Publishers and Distributors, Delhi.

Curing

The fermented beans contain about 33% water. They are therefore dried to a moisture content of 5-8% in the sun or in hot air dryers. During this process the colour of the shell becomes dark brown.

Roasting

The dried beans are cleaned sorted and roasted. Roasting develops characteristic flavour and colour. It also causes change in the chemical structure of polyphenols producing less astringency compounds. Roasted beans are passed through corrugated rollers to break their shells and to separate the germ. The roasted dehulled and degermed beans are called 'nibs'. Usually there is some blending of nibs of different varieties of cocoa before they are processed further. The roasting also changes the colour to dark brown.

Grinding and defatting

The roasted beans are cooled and gently crushed soon after, to fracture the husk and break down the kernels into their natural angular fragment or nibs. The roasted nibs are ground using stone mills to a fine paste or liquor. The heat produced during grinding causes the cacao fat to melt. The melted fat carries with it in suspension finely ground particles of cacao. This is known as the cacao mass or chocolate liquor or bitter chocolate. This mass solidifies at 30°C. Cacao mass is very rich in fat (50-55%) and cannot be used directly for preparation of any beverage. It is subjected to filter pressing to separate out a major part of fat (cocoa butter). The amount of fat left in pressed cake can be varied by conditions of pressing. This pressed cake is then cooled, ground in special mills and sifted through fine silk screens. The fine powder mixed with flavouring materials and homogenised is the cocoa from which the beverage is prepared.

Dutch processed cocoa or alkalised cocoa is prepared by treating the beans prior to roasting or the milled nibs before pressing of the cocoa cake with 2-3% alkali (potassium, sodium, ammonium carbonate or sodium bicarbonate). This treatment neutralises the free acids present and gives a product which is more soluble and darker in colour. Dutch processed cocoa is less bitter and is emulsified more easily with milk than the natural processed one. The pH of the Dutch processed cocoa is 6.8-7.5 and that of the natural processed one is usually 5.2-6.0.

According to BIS specification, cocoa used for beverage should contain 20% cocoa fat. Medium fat cocoa contains 10-20% fat and low fat cocoa contains less than 10% fat. Vanilla and cinnamon are incorporated into cocoa powder.

Chocolate

If no fat is removed from the nibs, the temperature maintained during grinding, i.e., 30-32°C and high fat content, results in a fluid mass. This is run into moulds where it hardens producing cake chocolate. Chocolate contains more fat than beverage cocoa. In preparation of high quality products, cocoa butter

obtained as a by-product in cocoa manufacture is added to augment the level of fat content.

There are many types of chocolates depending on the level of cocoa mass, added cocoa butter, sugar, milk and other ingredients.

Composition of cocoa and chocolate

Cocoa is used as a beverage. Chocolate is used mainly as confectionery and to a small extent as beverage.

Fat

Chocolate contains not less than 50% and not more than 58% weight of cacao fat. Cocoa may vary in fat content from 10-22%. When cocoa is substituted for chocolate particularly in baked products, approximately 3.3 table spoon of cocoa and 1 table spoon of fat are considered equivalent to one ounce of chocolate. The fat of chocolate contributes to its eating quality because it has a sharp melting point that is close to the body temperature. This results in rapid melting of chocolate in mouth and release of flavour substances.

Nutritive value of cocoa and chocolate beverage

Because the beverages are usually made with milk they have a food value similar to milk in proportion to the amount of milk used. Unlike tea leaves and coffee grounds which are strained from the beverages, cocoa and chocolate remain in the beverage thus adding fat, starch and other nutritious constituents to milk to increase. Table 12.4 gives nutritive value of cocoa and chocolate.

Due to high fat, these are a source of energy.

Table 12.4: Percentage nutritive value of cocoa and chocolate.

Constituents	*Cocoa*	*Chocolate*
Water	4.6	5.9
Protein	21.6	12.9
Fat	28.6	48.7
Carbohydrate	37.7	30.0

Making cocoa and chocolate beverage

Owing to its high starch content, cocoa will lump if directly put into a hot liquid. It should be mixed with a small amount of cold liquid before being combined with other ingredients.

When chocolate is used it sticks to the container and gets scorched when heated. We should use low temperature or double boiler. The melted chocolate is then blended with other ingredients.

Cocoa and chocolate thus treated are heated to boiling and held at that temperature for sometime to gelatinise the starch. This gives body and flavour to the beverage and reduces the amount of sediment that settles from either of the beverages.

The sugar required to give a good flavour to cocoa and chocolate products is probably slightly higher than that of tea or coffee.

FRUIT BEVERAGES

In India a little over 60% of fruit produced is used in fruit based beverages. There are different types of fruit beverages:

Fruit juice: This is a natural juice pressed out of a fresh fruit. This is unaltered in its composition during preparation and preservation, e.g. fresh juice and canned natural fruit juice.

Fruit drink: This is made by liquefying the whole fruit. At least 10% of the volume of undiluted drink must be whole fruit, e.g. grape juice, apple juice and mango juice.

Fruit squash: This is made from strained fruit juice, sugar and preservative. This contains 25% fruit juice, 45% sugar, e.g. mango squash.

Fruit cordial: This is a fruit squash from which all suspended matter is completely eliminated by filtration or clarification. Clarification is done by the use of pectic enzymes or finning agents. The finning agents produce a flocculent which gradually settles carrying down with it colloidal suspension. Clarified juice can be preserved by using freezing technique, pasteurization or the addition of chemical preservatives such as sodium benzoate or potassium meta bisulphite, e.g. lime cordial. Clear juices can be prepared from banana and apple also.

Fruit punch: Fruit punches are made by mixing the desired fruit juices. This contains 25% of total fruit juice and 65% of sugar.

Fruit syrups: In fruit syrup only one type of fruit is used. These are concentrations of fruit juices preserved with sugar. The fruit is crushed to a coarse puree and left overnight for fermentation. This concentrates the flavour and causes the juice to separate from the solids. It is filtered. When this juice is heated with sugar it transforms into syrup. Proportions of 500g sugar to ½ pint of juice will make the syrup of medium strength. It is thinned with water or soda water and served with ice. Fruit syrups can also be served with milk. To prevent the milk from curdling milk is poured into the syrup very gradually and the mixture is stirred briskly.

Fruit juice concentrates: This is the fruit juice which has been concentrated by the removal of water either by heat or freezing.

Carbonated fruit beverages: Carbonation is the process of mixing sufficient carbon dioxide with water or beverage so that when served, the product gives off the gas in fine bubbles and the characteristic pungent taste or tang one feels.

Another advantage of carbonation is the removal of air which results not only in anaerobic condition, but also reduces the oxidation of ascorbic acid.

Fruit juice beverages are generally bottled with carbon dioxide content varying from 1 to 8 g/litre, though this concentration is much lower than that required for complete inhibition of pathogenic bacteria.

For citrus carbonated beverages, there is a need for a weighting agent to raise the specific gravity of the flavour oil to enable its uniform distribution. So far, soft drink industries were using Brominated Vegetable Oils (BVO) for this purpose but on the recommendation of World Health Organisation, BVO has been banned by many countries including India as it was found to be carcinogenic in nature. Hence substitutes for BVO like rosin ester (ester gum) sucrose ester, polyolbenzoates, protein clouds and starch based gums are being used.

Ascorbic acid as well as pentose sugars give rise to furfural which may polymerise or combine with amino compounds to cause nonenzymatic browning in fruit and vegetable products.

The nutritive value of some beverages is given in Table 12.5.

SOUPS

Soups are served at the beginning of all formal dinners as an appetiser. They also provide nourishment. Clear soups prepared with meat stock are rich in extractives, full-flavoured, and stimulate the appetite. Some soups are rich and highly nutritious, with chunks of meat, vegetables, and noodles, macroni, rice or barley. They may contain milk in the form of white sauce or grated cheese.

Terms used to describe soup

Stock	:	It is the liquid obtained from the long cooking of meat, poultry, fish or vegetables in water. It is seasoned with herbs and spices.
Brown Stock	:	It is made from lean beef and bone. Part of the meat is browned before it is added to water.
White Stock	:	It is made from veal or chicken. The meat is not browned.
Broth	:	It is the liquid resulting when meat or poultry is simmered in water.
Bouillon	:	It is prepared from brown stock, lightly seasoned, and clarified.
Consomme	:	It is made from two or more kinds of meat (beef, veal, and chicken). It is highly seasoned, clarined and strained.
Cream soup	:	It is a combination of white sauce and a puree of vegetables or fish, such as cream of pea, tomato, carrot, celery, corn, spinach, bean, and oyster or clam bisque. The term bisque is applied to cream soups prepared from shellfish.
Chowders	:	These are made with milk, fish, shellfish, or vegetables such as potato, onion and corn.
Gumbo	:	It is a mixture of chicken, oysters, crab, shrimp, tomatoes, okra and seasonings.

Table 12.5: The nutritive value of some beverages (values per 100 g)

Name of Beverage	Water	Fat	Total Carbo-hydrates	Calcium	Iron	Carotene	Thia-min	Ribo-flavin	Vitamin C	Calorific Value
	g	g	g	mg	mg	µg	mg	mg	mg	kcal
Fruit juice										
Apple juice	85.9	–	13.8	6	0.5	4	0.02	0.02	1	55
Grape juice	85.3	–	13.7	8	0.3	20	0.02	0.02	3	55
Mango juice	84.2	–	14.6	12	0.5	1500	0.03	0.02	49	44
Orange juice	87.5	–	11.0	19	0.2	190	0.03	0.02	49	44
Pineapple juice	86.2	–	13.0	15	0.5	80	0.03	0.02	19	52
Tomato juice	93.5	–	4.3	7	0.4	1050	0.03	0.02	16	17
Dilute squash										
Orange squash	83.2	–	15.2	5	0.2	20	0.01	0.01	6	61
Lemon squash	83.4	–	15.0	7	0.2	–	0.01	0.01	5	60
Pineapple squash	82.9	–	15.2	6	0.2	50	0.01	0.01	5	61
Mango squash	82.9	–	15.6	8	0.2	500	0.01	0.01	6	62
Miscellaneous beverages										
Coconut water	93.9	–	5.9	10	0.1	–	0.01	0.01	2	24
Coconut milk	89.8	7.2	2.0	20	0.2	–	0.02	0.01	1	76
Neera	84.7	–	14.3	40	1.0	–	0.02	0.02	13	57
Soft drinks carbonated	88.0	–	12.0	–	–	–	–	–	–	48
Sugarcane juice	90.2	–	9.1	10	1.1	–	0.02	0.02	5	36

Source: Swaminathan, M., 1995, Food Science chemistry and experimental foods. The Bangalore Printing & Publishing Co. Ltd. Bangalore.

Preparation of soups

Less tender cuts of meat or poultry are rich in extractives and together with bone, provide the ideal combination for full-flavoured meat stock. The meat or chicken should be cut in pieces to increase the surface and thus facilitate the extraction of purines. Long cooking at a simmering temperature is essential for maximum extraction of purines. Diced vegetables, salt, spices, and herbs are added during the last hour of the cooking period for best flavour.

In the preparation of cream soups it is customary to use part of vegetable or fish puree to 1½ to 2 parts of thin cream sauce. Pureed vegetables may be used as such or vegetables may be sieved after they have been cooked sufficiently to become soft. The heated puree should be added gradually to the hot sauce to prevent lumping and curdling. This is especially important in the preparation of cream of tomato soup since the acid present is likely to produce curdling. Well cooked grams or beans can also be used as soups.

VEGETABLE JUICES

Raw mango panna is prepared by boiling, extracting juice and adding sugar and preservative. For 500g of juice 1kg of sugar and 50 ml of water are added.

Carrot and orange juices are extracted in a food processor. A pinch of salt improves the flavour. It should be served cold.

For preparing tomato juice, it is cut into pieces and passed through the churner and skin and seeds are discarded. The puree is diluted with water and seasoned with salt, pepper and lime juice.

Lactic fermented juices

The vegetable or the fruit is mashed and inoculated with a particular lactic acid bacteria and the mash is allowed to ferment 2 to 3 days. It is then sieved and juice is extracted. This can be stored at room temperature for more than six months without any detectable sign of spoilage.

Lactic acid fermentation brings about desirable physico-chemical and sensory attributes to the product. The flavour is highly enhanced. B-vitamin content is increased significantly. A clear juice is obtained. Vegetables like tomato, cucumber, ash gourd, pumpkin, carrot, bitter gourd and various other vegetable juices have been successfully preserved at CFTRI., Mysore.

MILK BASED BEVERAGES

Milk is rightly valued for its nourishing properties but it is also prized for its versatility. Served on its own, hot or cold milk is a soothing and nourishing drink.

Flavoured milk: Different colours and essences are added to milk e.g. rose milk.

Milk shake: Fruit pulp like banana can be added to milk to prepare banana milk shake. Other fruits like sapota or orange or mango can also be made into milk shakes.

Dessert: Milk is used in combination with cereals and pulses in the preparation of payasam or kheer. In badam kheer almonds are used along with milk. Tondai is prepared with nuts, kaskas, sugar, saffron and milk. Ice cream is made from milk.

Coffee, tea and cocoa: In India, coffee and tea are consumed mostly with milk.

Figure 12-i: Lactic fermented juices

1. Bitter gourd juice 2. Fenugreek leaves juice

Source: Gupta, Uma, 1995, Nutritional quality of lactic fermented beverages. M.Sc. thesis, Mysore University.

Cocoa and chocolate drinks are always made with milk. The milk should be heated separately and then poured on to the dissolved cocoa or chocolate. Continuous whisking while the flavouring and milk are being blended will make the drink as smooth and light as possible. Whisking incorporates air into the drink to make it frothy and also prevents scum on the surface of the hot liquid.

Miltone: It is produced by CFTRI Mysore by blending equal parts of milk and an emulsion of protein from groundnut. Miltone has a similar composition as that of toned milk. This milk has protein content of 3.5%, fat content of 2% and 5% sugar. It can be substituted for ordinary milk.

Soup: White sauce is used in soups as thickening agent. In preparing white sauce milk is used.

Egg nog: Milk can be mixed with whole eggs or just egg yolks to make a

nourishing drink with smooth creamy consistency. Egg whites can be beaten into soft peaks and folded into chilled, flavoured milk to produce a foamy aerated drink.

Fermented milk: Milk is fermented with lactobacilli and curd is prepared. Curd can be diluted and combined with sugar syrups, fresh fruit, herbs and spices to make sweet or savoury drinks. By diluting with water butter milk is prepared. with the addition of salt and lime juice this beverage makes a desirable thirst quench drink in summer. Cuminseed powder is also used as a flavouring agent in butter milk. Curd is beaten with sugar to make lassi.

MALTED BEVERAGES

Malted beverages are also known as Amylase Rich Food (ARF). A small amount of any whole cereal grain (wheat or ragi) is steeped overnight in 2-3 times its volume of water. The excess water is drained and the moist seed is germinated for 24-48 hours till the sprouts are evident. Then the grains are sun dried for 5-7 hours and lightly roasted to remove any surface moisture. Sprouts are removed by hand aberration and the grains are milled or powdered. This is stored in an air tight bottle.

ARF is rich in the enzyme amylase. Just tiny or catalytic amounts of any germinated cereal flour can instantly liquefy or reduce the dietary bulk of any viscous multi-mixed gruel provided cereal flour is the main ingredient. The amylase cleaves the long carbohydrate chains in the cereal flour into shorter dextrins. For the enzymatic reactions three conditions are required in the gruel:

- It must be homogenous.
- It must be moist.
- It must be hot at least 70°C.

Just at least half a tea spoon of ARF can reduce even a very high total solid concentration of 45 g made up of 25 g flour, 15 g sweetener, 5 g oil cooked in 100 ml of water. This remarkable property makes it possible to offer the weaning child a low viscosity and a high energy dense preparation from habitual ingredients that are used for young child feeding in poor home.

It is inexpensive. It can be made at household, community level and even at commercial level.

CARBONATED NON-ALCOHOLIC BEVERAGES

These beverages are generally sweetened, flavoured, acidified, coloured, carbonated and sometimes chemically preserved.

Ingredients

Sugar: This is mostly sucrose, made into syrup. The finished beverage will contain about 8 to 14% sugar. The sugar gives sweetness and calories and body to the drink.

Flavourings: These come in the forms of synthetic flavour compounds, natural flavour extracts and fruit juice concentrates. The flavours must be stable

under the acidic conditions of the beverage and on exposure to light for a year or more.

Cola flavours generally contain a source of caffeine which is a mild stimulant. When fruit derivatives which contain flavour oils are used it is necessary to employ an emulsifying agent to keep the oils from separating out in the beverage. Water soluble gums at low levels are the principal emulsifiers employed for this purpose.

Colours: Natural fruit extracts, synthetic colours, particularly the certified coal tar colours are used. Caramel from burned sugar, a non-synthetic colour is also commonly used.

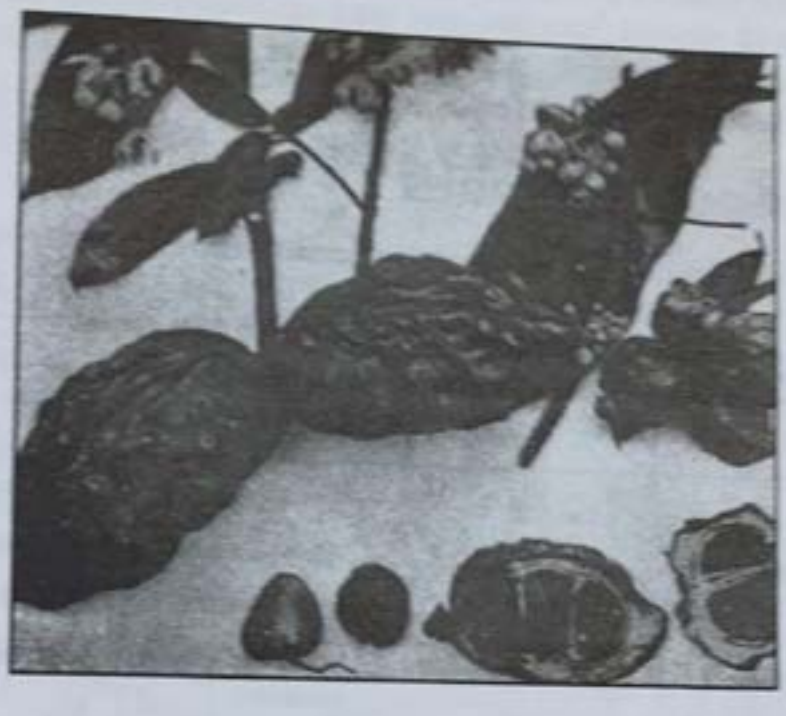

Figure 12-j: Branch and nut of cola, African tree. Contains caffeine, theobromine and cola red. Colouring matter is used in wines.

Source: New Larousse, 1983, Gastronomique—The world's greatest cookery reference book, Prosper Montague publishing group Ltd. Hamlyn, London.

Acid: Carbon dioxide in solution contributes to acidity but this is supplemented with additional acid in most carbonated drinks. The main reason for acidification is to enhance the beverage flavours. The principal acids used are phosphoric, citric, fumaric, tartaric and malic acids. Phosphoric acid is the choice in the case of colas and other non-fruit drinks.

The acid added is not enough to ensure long term microbial stability and additional preservative, sodium benzoate at a level of about 0.3 to 0.5% is added.

Water: This may be present to the extent of 92%.

The alkalinity must be low (50 ppm) to prevent neutralisation of the acid used in the beverage, which would alter flavour and decrease the preservative property of the beverage. Iron and manganese must be low to prevent reaction with colouring agents and flavour components. Residual chlorine must be virtually non-existent since it adversely affects the flavour of the drink. Turbidity and colour must be low for an attractive appearance of the drink.

To achieve these high water standards, bottling plants will generally further condition water with such additional treatments as chemical precipitation of minerals, deionisation, activated charcoal to remove odours, flavours and residual chlorine and deaeration to remove oxygen.

Carbon dioxide: The sparkle and zest of this class of beverages are the result of their content of carbon dioxide gas. The carbon dioxide enhances flavour, contributes acidic preservative action, produces the tingling effect on the tongue and gives the sparkling effervescent appearance to the beverage.

Carbonated beverages when opened and released from pressure are supersaturated solutions of gas with more carbon dioxide dissolved in the beverage than would be possible at normal pressures. Left alone for two hours, the drink would slowly lose the gas and go flat. Sodium chloride particles seem to provide an especially good surface for gas to collect on, form bubbles and quickly rise to the surface and escape.

MISCELLANEOUS BEVERAGES

Table 12.6 gives procedures for making some miscellaneous beverages.

Table 12.6: Some miscellaneous beverages.

Beverage	*Comment*
• Nira	Sweet drink from fresh sap of the palms
• Barley water	Water in which barley is cooked.
• Tisanes	Made from dried herbs and flower blossoms.
• Synthetic syrup	Made from sugar, artificial colour and essence.
• Coconut water	Refreshing sterile drink
• Sugarcane juice	expressed from sugarcane
• Nut infusion	made by steeping in hot water and grinding
• Panakam	made from jaggery, ginger and cardamom.
• Jal jeera juice	Made from cumin seeds, mint, pepper and black salt.
• Kokam juice	Made from kokam fruit.

ALCOHOLIC BEVERAGES

Toddy

While nira, tapped from the palmyra tree is transparent, pleasant smelling and sweet, toddy is a pale frothy liquid with characteristic aroma, and a slightly acid and pungent taste. It is an inexpensive and refreshing beverage. Its nutritive value depends on sugar and yeast present in it.

Spontaneous fermentation of the juice produces about 3% of alcohol and 0.1% of acids during the first 6-8 hours. After this, alcohol content increases to

nearly 5% and later begins to decrease while the amount of acids continue to increase rendering the liquid unsuitable for human consumption. Butyric acid is the cause of this.

Beer

The principal raw materials of beer manufacture are the cereal grains, particularly malted barley, rice and corn which supply carbohydrates for fermentation by saccharomyces yeast into ethyl alcohol and carbon dioxide.

Wine

As grapes mature the wine yeast *saccharomyces ellipsoideus* naturally accumulates on the skins. When the crushed grapes or filtered juice is placed at a temperature of about 27°C the juice proceeds to ferment yielding essentially equal molar quantities of ethyl alcohol and carbon dioxide and traces of flavour compounds.

- Wash the fruits, remove all stems and leaves. Then crush the fruit.

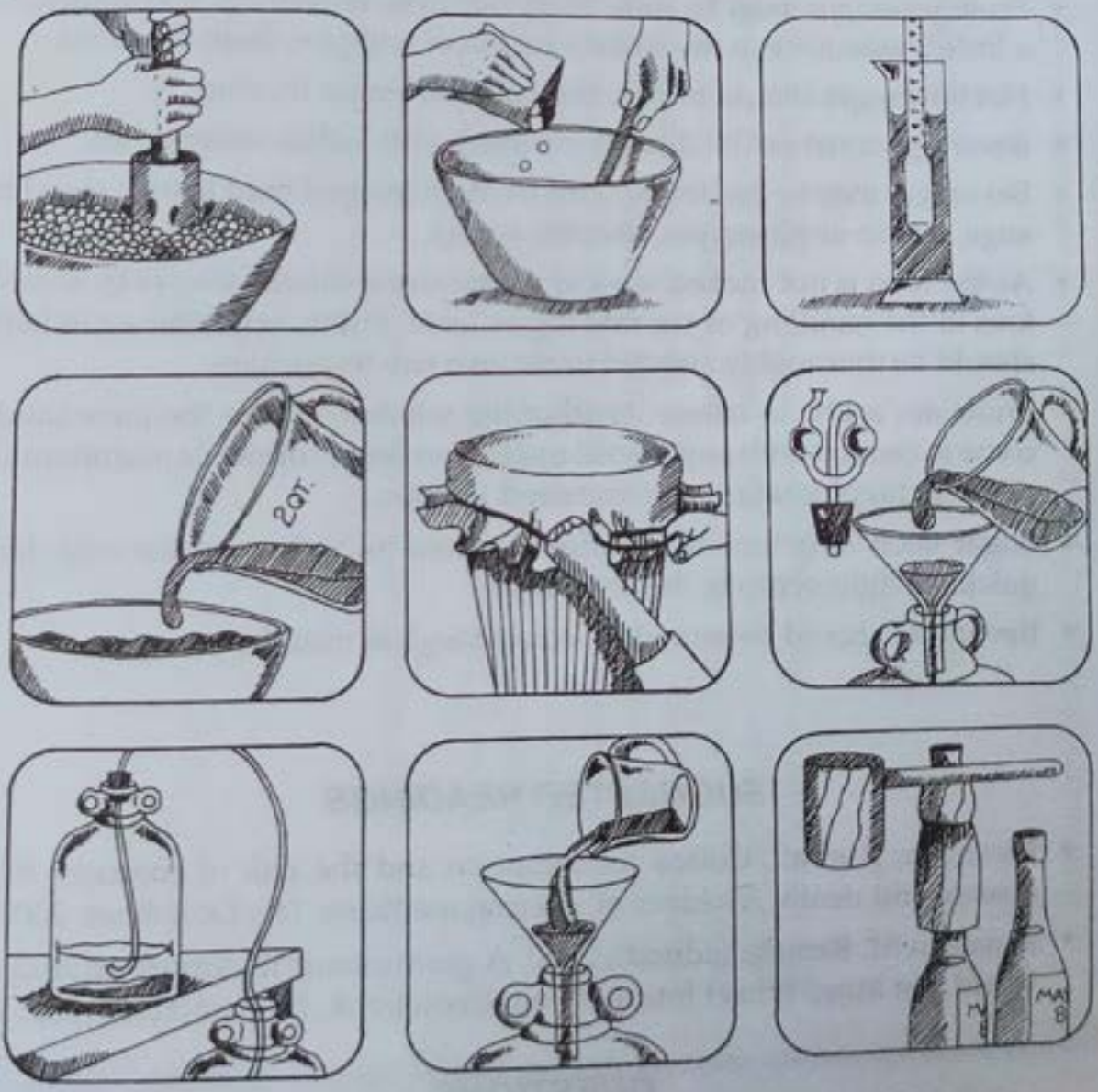

Figure 12-k: Wine making-step by step

Source: Chrett Robert, 1981, Making Homemade wine. Garden way publishing Poronal, Vermont.

- Add crushed Campden Tablets. (to discourage unwanted growth of micro organisms)
- Test the must with a hydrometer and titration kit.
- Add the yeast starter.
- Cover the must tightly with a plastic sheet and secure it with a string.
- When the weight of the must reaches SG 1.025 to 1.030, transfer the must to a carboy and fit the top with an air lock.
- Rack the wine into a secondary fermenter.
- Fine the wine with a special gelatin solution and rack again.
- Bottle the wine.

Points to remember while making beverages

- Beverages should be served as soon as possible after preparation in order to retain fresh natural flavour.
- Fruit beverages must be sufficiently tart to be refreshing. The addition of a little lemon juice to the sweet fruit juices will give them character.
- Hot beverages should be hot, and cold beverages ice cold.
- Beverages must not be diluted too much with either water or ice.
- Beverages may be garnished with fresh uncrushed mint leaves, sliced orange, lemon or pineapple, cherries or ices.
- As the food is not cooked most of the time one should always be scrupulous in the handling of the raw ingredients. Fruits, vegetables and herbs should be thoroughly cleaned to remove any impurities.
- Fruits are acidic in nature. Neither the whole fruit nor the juice should come in contact with any utensil made from iron, copper or aluminium to prevent discolouration and impaired flavour.
- Sugar takes long time to dissolve in a cold juice. To sweeten cold drink quickly a light syrup in the best choice.
- Beverages should be served in attractive glass tumblers.