5 Confectionery Technology

Contents

The Indian confectionery market is changing rapidly in terms of trends and consumer behavior pattern. Various multinational companies have entered in the Indian confectionery market by launching new products at affordable prices, wide varieties and addressing the nutritional concern. This has led towards an increased per capita consumption at about 2.3 kg in 2019.

Fig. 5.1 Confectionery products

Fig. 5.2 Confectionery industry

5.1 CONFECTIONERY TECHNOLOGY

Confectionery is related to the food items that are rich in sugar and often referred to as a confection. They contain a large amount of sugar, having a high calorie content, pleasant taste, flavour and easily assimilated by the body. The high nutritive value of confectioneries is due to the considerable carbohydrate, fat, and protein content. Many confections are enriched with vitamins.

5.2 TYPES OF CONFECTIONERY

On the basis of ingredients, methods of production, and final product, confectioneries fall into two main groups:

i. Sugar confectionery:

These are the confectionery products mainly made up of sugar added with flavourings and additives. E.g. candy, chocolate, sweet, toffee, etc.

Fig. 5.3 Sugar confectionery

ii. Flour confectionery:

These are the products in which the base ingredient is grain flour, sweetened with sugar. E.g. cookie, biscuit, cake, pastry, etc. (Chapter 4 deals with flour confectionery.)

In this chapter we will be discussing the different types of sugar confectionery which are as below.

A. Caramels, toffees and fudge:

These are made from sugar with addition of ingredients such as milk-solids and fats (butter and vegetable fats). The characteristic colour and flavour is due to maillard reaction and caramalization.

Can you recall ?

Caramelization is a process of browning of sugar by heating it at desired temperature that results in brown colour and pleasant flavour called caramel.

i. Caramel:

Caramels are derived from a mixture of sucrose, glucose syrup, and milk solids. The mixture does not crystallize, thus remains tacky. Caramels are of three types on the basis of temperature of process such as soft (118 to 120^{0}C), medium (121 to 124^{0}C) and hard (128 to 132^{0}C).

Fig. 5.4 Caramel

Do you know ?

Maillard reaction :

Maillard reaction is a chemical reaction between protein (amino acid) and carbohydrate (sugar), which occurs during heating process that gives rise to brown complex compound on the surface of the product. e.g. bread crust colour.

ii. Toffees:

Toffee is made by heating process of sugar/ jaggery with butter and milk solids. Toffees have lower moisture content than caramels and consequently have a harder texture. The use of fat and milk solid is less than the caramel. The final temperature reaches to about 152^{0}C.

Fig. 5.5 Toffee

iii. Fudge:

Fudge is made by boiling milk, butter and sugar at about 116^{0}C so as to get a soft-ball consistency stage. While cooling the mixture, crystallization of sugar gives a coarse grain to the product. It is also prepared in chocolate flavour by adding 5 to 8 percent of cocoa syrup.

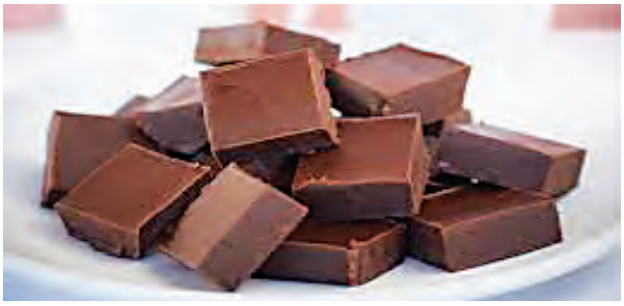

Fig. 5.6 Fudge

B. Hard candy or boiled sweet:

A hard candy, or boiled sweet, is a candy prepared from sugar and liquid glucose boiled to a temperature of about 149-166^{0}C or to the hard-crack stage. After the syrup boiled to this temperature, then it is cooled to form a solid mass containing less than 2 percent moisture. It becomes stiff and brittle as it reaches to room temperature. Within this group a wide variety of products with different colours, flavours and shapes can be get developed. E.g. lollipops, lemon drops, peppermint drops and disks, rock candy, etc.

Fig. 5.7 Hard boiled candy

C. Taffy or chews:

Taffy or chews are a type of candy that is made by stretching and folding a sticky product for many times. The sticky product is prepared

Fig. 5.8 Chews

by boiling sugar, butter or vegetable fat, colour and flavours. The stretching and folding action at 50^{0}C incorporates air bubbles in product and hence it becomes soft, light and opaque.

D. Gelatinized sweets:

This group contains the products from hard gum to soft jellies. They are prepared by combining sugar, glucose syrup and gelling

Fig. 5.9 Gelatinized sweets

Do you know ?

Syneresis: It is a property of leaching out liquid or syrup from gel structure. It is a type of defect in jellies and gums. It occurs during storage period. It is also called as weeping of jelly. This occurs due to excess addition of acid, insufficient pectin, etc.

agents like starch, gelatin or pectin, and heating it at 50 to 80^{0}C. They are distinct from other sweets as their texture is set by gelatinizing agent. E.g. gums, jellies and marshmallows..

E. Fondants and creams:

Fondant is made by boiling a sugar solution with the optional addition of glucose syrup. The mixture is boiled to a temperature in the range of 116-121^{0}C, cooled, and then beaten in order to control the crystallization process and reduce the size of the crystals. Creams are fondants which have been diluted with a weak

Fig. 5.10 Sugar fondant

sugar solution or water. These products are not very stable due to their high water content, and therefore have a shorter shelf-life.

F. Chocolate confectionery:

Chocolate is prepared by roasted and ground cacao seeds which are further converted into powder, liquid paste and block etc. Several types of chocolate based confectionery products are prepared worldwide such as milk, white and dark chocolate etc. It is also used as a

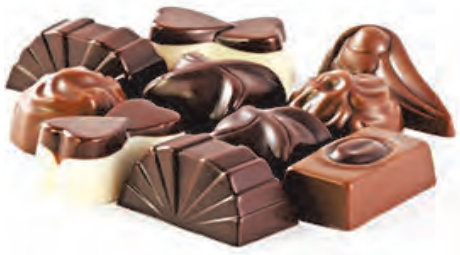

Fig. 5.11 Chocolate

Do you know ?

Chocolate is solid at room temperature yet melts easily within the mouth. This is due to main fat in it, which is called cocoa butter. Chocolates are always stored under refrigerated condition so as to remain firm, stable and avoid its melting.

characteristic flavouring and colouring agents in various food products.

G. Indian confectionery *(Mithai)*:

Fig. 5.12 *Mithai*

Mithai is a generic term for confectionery in India. It is typically made from dairy products and/or some form of flour. Sugar or molasses are used as sweeteners.

Indian confectionary may be broadly classified under four groups.

a. *Khoa* based products such as *burfi*, *pedhas*, *gulab jamun*, *kalakand*, etc.

b. *Channa* based products such as *sandesh*, *rosogolla*, *rasmalai*, *chamcham*, *channa kheer*, etc.

c. Flour, sugar and fat based products such as *sohan halwa*/*papadi*, *mysorepak*, *laddoo*, *boondi*, *jalebi*, etc.

d. Others sweets such as walnut *burfi*/cashew nut *burfi* and other nut candies, *shrikhand*, *shankarpale*, etc.

5.3 INGREDIENTS IN CONFECTIONERY

For every confectionery with a quality characteristic, the ingredients play an important role. The basic ingredients used for confectionery are:

a. Sweeteners: Majority of the confectionery products are sugar based. The following sweeteners are most commonly used in confectionery.

i. Sugar:

Sugar is the main ingredient of confectionery. Most commonly used sugars are cane sugar and beet sugar. The use of beet sugar is limited in Indian industry because of high availability of cane sugar. Depending upon the intended use the sugar is used in various forms, as granulated, fine, icing and in the form of syrup (Liquid).

Granulated sugar

Fine sugar

Icing sugar

Sugar syrup

Fig. 5.13 Forms of sugar used in confectionery

ii. Invert Sugar:

Invert sugar syrup can be prepared by heating sucrose (sugar) and water together by adding edible acid (citric/tartaric/acetic/ lemon juice) or an enzyme (invertase) upto thick consistency.

Fig. 5.14 Invert syrup

Can you recall ?

Invert sugar

Sucrose solution $\xrightarrow[\text{enzyme}]{\text{acid}}$ Glucose + Fructose (Invert sugar)

iii. Corn syrup:

It is purified concentrated aqueous solution which is made from starch of corn. It is also known as glucose syrup to confectioners. It is used to soften texture, add volume and enhance flavour.

Fig. 5.15 Corn syrup

iv. Honey:

Honey is natural invert sugar. It is rich in fructose and is used in developing low calorie confections. It contributes to the sweet taste and delicate flavour.

Fig. 5.16 Honey

v. Other Sweeteners:

These are the compounds which give intense sweetness without adding much bulk to the product. Their sweetness is much more than that of sucrose.

E.g. Sorbitol, mannitol, saccharine, aspartame etc.

b. Milk and milk products:

Milk and milk products are major ingredients in the chocolate and confectionery industry. Milk powder, milk crumb, condensed milk and evaporated milk are the form of milk products being used largely. They provide flavour, bulk, body and structure to the product.

c. Water:

Water is used to dissolve the sugar and other minor ingredients. It acts as a distribution medium for other ingredients.

d. Salt:

Salt is used in small quantity. It enhances the taste and flavour of the other ingredients.

e. Confectionery fat:

Emulsified, hydrogenated shortening is usually used. Shortening should be neutral in taste and flavour. Butter can also be used along with other fats/oil.

f. Stabilizers:

Stabilizers are used to absorb excess moisture. This can avoid crystallization of sugar. Stabilizers may be vegetable, tapioca starch, pectin and wheat or corn starch.

g. Gelling/ thickening agents:

These are the substances that form gels and foams. Some of them are also used as glazing coating. Some of the examples are as follows :

i. **Gelatin:** It is a product obtained by partial hydrolysis of collagen derived from skin, connective tissue and bones of animals. It is available in the form of sheet, flake or powder. It swells when soaked in cold water and gets dissolved on heating. The heated solution upon cooling sets into jelly.

ii. **Pectin:** It is a natural gelatinizing agent present in fruits. It is used for thickening of jam and jellies.

iii. **Gum:** Gums are used as thickening agent and also improves yield of product. They prevent syneresis, splitting and shrinkage during storage of confectionery products. E.g. xanthan gum, guar gum, gum arabica, gum tragacanth, etc.

iv. **Agar-agar:** It is a seaweed and used in the form of dried extruded strips and powder. It forms a well set jelly after boiling in water at 0.2 to 0.5%.

h. Colours and flavours:

Most of the colours and flavours used in confectionery production are synthetic that may be nature identical.

5.4 MANUFACTURING PROCESS

A wide variety of confectionery product can be prepared by using different ingredients, temperature of boiling and method of shaping. In all cases, however, the principle of production remains the same and is outlined below:

i. Balance the recipe
ii. Prepare the ingredients
iii. Mix all ingredients together
iv. Boil the mixture to reach the desired temperature
v. Cool, shape, pack

Many factors affect the production and storage of sweets:

i. The degree of sucrose inversion
ii. The time and temperature of boiling
iii. The residual moisture content in the confectionery
iv. The addition of other ingredients.

Degree of inversion

When a sugar solution is heated a certain percentage of sucrose breaks down to form invert sugar. This invert sugar inhibits sucrose crystallization and increases the overall concentration of sugars in the mixture.

Points to remember

- Confectionery is related to the food items that are rich in sugar.
- The confectionery products falls into two types i.e. sugar confectionery and flour confectionery.
- Caramel is obtained by the process of caramalization.
- The moisture content of hard boiled candy is very less i.e. 2%.
- Cane sugar is most commonly used sugar for confectionery products.
- The degree of inversion and residual moisture content in the product defines the storage quality of confectionery products.

Exercise

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

i. Per capita consumption for confectionery is about ___kg.

a. 2.3 b. 3.3

c. 4.3 d. 5.3

ii. Fudge is made by boiling milk and sugar at about _____ temperature.

a. 116°C b. 216°C

c. 160°C d. 180°C

iii. Lemon drops comes under _____ type of confectionery.

a. Caramel b. Taffy

c. Hard Boiled

d. None of the above

iv. Invert sugar is prepared by _____ process.

a Reversion. b. Inversion

c. Both a and b

d. None of the above

v. _____ is a natural gelling agent present in fruits.

a. Gelatin b. Pectin

c. Protein d. All of the above

b. Match the correct pair.

	A		B
i	Soft caramel	a	Cake
ii	Hard candy	b	Other sweetener
iii	Saccharine	c	Starch of corn
iv	Flour confection	d	118 -120°C
v	Corn syrup	e	149-166°C
		f	Toffee

c. Do as directed.

i. Select the odd word

Gelatin, Pectin, Egg, Agar-agar

ii. Complete the word with the help of clue.

Clue : I am a confectionery product.

	O		D		N	

iii. Unscramble the word?

Clue : I am a sugar confectionary gefdu.

Q. 2 Answer the following questions.

i. What are gelatinized sweets?

ii. Define syneresis.

Q. 3 Write short notes on the following.

i. Sweeteners

ii. Caramel, Toffee and Fudge

iii. Degree of inversion

Q. 4 Long answer question.

i. Explain in detail about ingredients used in confectionery

ii. Give details about manufacturing process of confectionery

Project :

i. Prepare a project on locally available Indian sweet products.

ii. Prepare a project report on imported candies and chocolates.