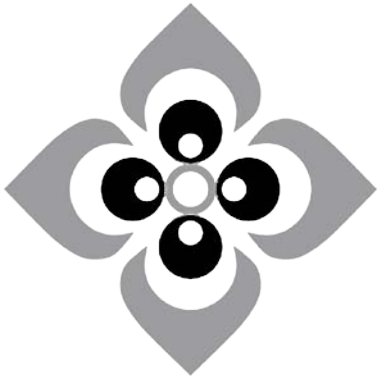

Consortium for Educational Communication

Module
on
Biscuits

By
DR. SUSHMA APPAIAH
M. Sc., Ph.D
Founder & CEO, Giggles of Livez (Golz)
Nutrition Councellor
Roopanagar, Mysuru-570026
Karnataka, India

TEXT

Introduction to Biscuit

Biscuits are cereal based products and baked to moisture content of less than 5%. Biscuit pronounced according to the old spelling “bisket,” a Fr. Form from Lat. *bis,* twice, and *coctum,* cooked, in reference to the original method of preparation; cf. Ital. *biscotto,* Sp. *bizcocho*, a form of bread. Biscuit is made in thin cakes of various shapes and baked as crisp and short. In the United States of America biscuits are called crackers, but the word biscuit is similar as used in the north of England i.e vesiculated bread baked in little flat loaves or cakes.

Biscuits are oven baked food items with greater nutritive value than plain bread of equal weight. They are classified as hard, soft and “batter” biscuits. They can be savory, sweet, plain – baked, filled or coated (or a mixture of several of these options). Some biscuits satisfy special dietary needs, such as those for high fiber, protein or extra vitamins (as in infant rusks). Biscuits also contain fat and often sugar, and are cut or molded into thin layers and baked rapidly and thoroughly. If packed in a moisture proof material, biscuits can have a long shelf life. Biscuit are largely consumed by children and teenagers.

The raw material chiefly used in biscuit manufacture is flour, but many other substances, such as butter, sugar, salt, various flavoring essences. The flour used by the biscuit-maker differs from the bread. The flour for bread should have absorption with considerable proportion of water and loaf with good texture and volume. For biscuits flour strength is not considered crucial. Commercially, different kinds of biscuits are made, ranging from plain water biscuits to the fancy biscuits glistening in sugar and piping.

Biscuit Production and Indian Scenario

Biscuits are very popular food items. They are pleasant in taste and do not require cocking

and hence ready to be served. The local demand for biscuits in India is met both by domestic production and imports. Annual production from 2001-2005 is shown in **fig 1.** In addition to the domestic production, biscuits are imported as well as exported by India **.**The demand for biscuits indicates the Indian population ever growing satiety for the biscuits.

Biscuit is one processed wheat product which has found acceptability in rural areas in our country. The raw materials for biscuits are flour, sugar and shortening. For protein enriched biscuits, soy flour or peanut flour or protein isolate can be added at 15-25 percent levels to provide 10 percent extra protein. Other ingredients include leavening agents, vitamins, minerals and flavors. In sweet biscuits, cane sugar is added while in salty biscuits, sodium chloride (0.5-0.1 percent) is added. Composition for sweet and salty biscuits are given in **Table 1.** The oven used for biscuit-baking is quite different from bread oven. It is much longer with sets of chains. These chains have special attachments on which the trays of biscuits are rested and passed through the oven for baking.

Ingredients for the Biscuits:

There are three major ingredients wheat flour, fat and sugar. To these ingredients, various small ingredients is added as leavening, flavor and texture.

Wheat Flour

The principle ingredient of biscuits is wheat flour. The wheat flour is composed of carbohydrate (as starch), protein and fat, together with some fibre, ash and trace minerals and vitamins.

The formation of the gluten, strength and elasticity is determined by the flour specification, recipe and the mixing processes. Wheat flour contains proteins including gliadin and glutenin. In the presence of water these proteins combine to form gluten. The gluten forms an elastic web, which gives the dough strength and transforms into a thin sheet for crackers and hard sweet biscuits. Shorter mixing time results in less development of the gluten

strands resulting in biscuits with short texture. The composition of various flour is shown in **Table 2**

Starch from wheat flour is insoluble in water, however the starch granules absorb a limited amount of water in the dough and swell. In normal baked products only partial gelatinization occurs. The gelatinization of the starch contributes to the rigidity and texture of the biscuit. As the starch gel is heated further, dextrinisation occurs. This contributes to the coloring of the biscuit. In soft dough products, the high sugar and fat content of the dough inhibits starch gelatinization. With high sugar and fat recipes, the dough has a low gel viscosity and strength. This produces short, soft biscuits and cookies.

Many times corn flour is used in combination with wheat flour. Corn flour is a white free flowing powder produced by wet milling of maize, followed by washing, concentrating, centrifuging, drying, milling and sifting to give a natural maize starch. It has a short gel texture, relatively high viscosity, easily dispersible in cold water. The protein in corn flour does not form gluten, thus used as an ingredient to produce a more tender biscuit with reduced gluten development.

Sugar

Common sugar (sucrose) is a carbohydrate derived from sugar cane or sugar beet. Sugar is used in biscuit formulations in a granulated or powder form. Sugar gives sweetness, but it is also important in developing the texture of the biscuit. Dissolved sugar tends to inhibit starch gelatinization and gluten formation and creates a biscuit with a more tender texture. Undissolved sugar crystals give a crunchy, crisp texture. Sugar crystals, which melt during baking, cool to a non-crystalline glass-like state which gives a crispy, crunchy texture, particularly on sugar topped biscuits.

Other reducing sugars are included in biscuit formulations in syrup form, for example glucose syrup, malt extracts, honey. The reducing sugars in the presence of amino acids produce the Maillard reaction which contributes to the colour of the biscuit. Sugar

specifications are depicted in **table 3.** The sugar level is on a dry bases and it is assumed that liquid sugar has 67% solids, invert syrups 80% solids, malt extract 80% solids, glucose syrups 80% solids.

Vegetable fats and Butter

Fats are vitally important ingredient in achieving the texture, mouth feel, and the bite of the biscuit. The fats are produced from good quality crude oils by a process of refining, bleaching and deodorizing. Typical blended vegetable dough fats are solid at ambient temperature and melt over a wide temperature range. Most fats used in biscuit making are melted below blood temperature (37°C), and this avoids a waxy mouth feel. Butter is used for its shortening and flavor. The flavor of the butter is complemented by sugar and vanilla during baking and gives a distinctive flavor and aroma.

Coconut oil is used for oils spraying. The oil is hydrogenated, neutralized, deodorized and bleached. Melting point is 32 – 34°C. The fat values in biscuit are based on pure fat, so margarines and butter are only 85%. The water level is the total added water. This is principally as liquid water but may be as fresh milk (87.6% water), butter and margarine (15% water), fresh eggs (75%), syrups (20%), liquid sugar (33%) etc.

Other ingredients used in biscuit are whole egg powder, Lecithin, Yeast, Ammonium bicarbonate, Sodium bicarbonate, Monocalcium phosphate, Salt, Sodium Acid Pyrophosphate, Sodium metabisulphite, Proteolytic enzyme.

Grouping of Biscuits based on method:

The taste and crispness of a biscuit depends upon the raw material used and the method of making. Depending upon these two factors, we can broadly divide the biscuits into the following categories:

1. Pastry dough
2. Creamed dough

3. Egg white mixture
4. Whisked egg dough
5. Doughs rich in honey and other sugar syrups.

Biscuits prepared from pastry dough

Both sweet and savoury biscuits can be prepared from this dough. Two basic pastry doughs are used for making biscuits-short crust dough and puff dough. The short crust dough consists of flour, fat and moistening liquid. Flour provides the bulk and fat contributes shortness to the biscuit.

The special points to be taken care of, while producing good short crust biscuits are:

1. Keep the ingredients at room temperature
2. Too much handling of dough should be avoided.
3. Use ice cold water for binding the ingredients. Do not add too much water.
4. Before rolling, chill the dough in a freezer so that butter becomes firm...E.g: Jam tarts, rich biscuits

Biscuits prepared from creamed dough

Creaming is the process of beating together butter and sugar so that air bubbles are forced into the batter. The aerated mixture is then moistened with eggs. Finally, flour is added to make the dough. Creamed dough provides many opportunities for imaginative shaping. It should be firm to be rolled out and cut with biscuit cutter into various attractive shapes like circles, hearts, diamonds, squares etc. Biscuit cutters are used for getting these basic shapes. A less firm dough can be dropped from a spoon to produce chunky, irregular shapes. Further, variations can be made by changing proportions of the basic mixture by

increasing the quantity of egg or a few drops of flavorings essence or grated rind of citrus fruits or ground spices. Blend of raisins, nuts, currants can be added.

Points to consider

1. In this method of biscuit making creaming is the most important step as it aerates the mixture by incorporating air bubbles. Creaming should be done properly so that the mixture increases in volume and becomes light and fluffy.
2. While adding eggs, sometimes the mixture may look curdled, but the flour will bind it.
3. Add flour gently and a little at a time. Avoid over working the dough as this would strengthen the gluten, making the dough tough when baked. E.g Fruit biscuits.

Biscuits prepared with egg white mixtures

Biscuits made from egg white mixtures are light in texture, e.g. macaroons. When egg whites are lightly beaten it becomes a loose foam which is used to bind dry ingredients. Nuts are often used as the basis of these mixtures, replacing the flour that provides the body of most biscuit dough. A blend of nuts and sugar, moistened with sufficient egg white forms a batter, which produce crisp light macaroons. These biscuits have a deliciously chewy texture.

Points to consider

1. It is important to seperate the egg white meticulously from the yolk so that no trace of yolk is left in the white. Egg yolk contains fat which prevents proper rising of egg

white.

2. Use scrupulously clean utensils, without a trace of grease.
3. Nuts, if used, should be finely ground to achieve a smooth, even mixture. E.g: Pea nut macroons.

Biscuits prepared from whisked egg dough**:**

These biscuits are made from egg white mixtures by using only the whites from the eggs, sugar and nuts, whereas whisked egg dough biscuits contain whole eggs, sugar and flour. Fats are optional. The quantity of flour varies based on preparation. By lowering the amount of flour, light biscuits can be made, which require a higher proportion of flour to make comparatively harder biscuits. Flavorings like lemon or orange rind, aniseeds, flavoured liqueur or spices like cinnamon can be added to the dough. The domed surface is a characteristic feature of these biscuits.

Biscuits from syrup, and honey dough:

Syrups are thick, sweet liquids like honey and molasses. These syrups provide extra sweetness, a warm brown colour and a distinctive flavour to the biscuits. In these doughs brown sugar and certain spices like ginger, nutmeg, cinnamon, cardamom etc is used to get richer biscuits.

Steps involved in biscuit making :

Mixing and Kneading**:**

Weighed amount of sifted flour, sugar, shortening and flouring agents are added and mixed. Water and baking powder are added and mixed continuously to obtain a dough of desired consistency. Optimum kneading (10-20 min) produces biscuits with fine structure, smooth crust and better appearance. Over kneading produces a compact toughened

product and under kneaded doughs give very tender biscuits, coarse in texture, small in volume and having a rough crust.

Sheeting and Shaping:

The dough is rolled into sheets of desired thickness by passing through pairs of rolls. The rolled dough sheet is cut by mechanically worked stamped divider fitted with dies.

Baking and Cooling:

The cut biscuits move forward on a continuous belt and transferred automatically to a continuous plate sheet or wire mesh bands traveling through the ovens. The length of ovens depends upon the production capacity. The biscuits are baked at 230°C for 15 min and cooled after baking.

Packaging:

The biscuits should be packaged in moisture and grease proof cellophane or metal foil laminated packaging.

Suggestion for making better biscuits:

1. For best results buy the whole spices, store them in air tight containers and grind the required quantities to ensure better flavor of the spices.
2. If the syrup is too thick to blend in the flour, warm it slightly. Butter at this stage helps

to get thinner consistency.

3. Always sift flour, baking soda and dry powdered spices together for even mixing.

Types of biscuits:

There are various types of biscuits

1. Cream crackers
2. Soda crackers
3. Savoury or snack crackers
4. Water biscuits and matzos
5. Puff biscuits
6. Hard Sweet, Semi Sweet and Garibaldi Fruit Sandwich Biscuits
7. Short dough biscuits

1. Cream crackers:

Cream cracker biscuits were first introduced in about 1885 by the Irish firm of Jacobs. Cream crackers have a simple unsweetened basic recipe of flour, fat and salt. This dough is always fermented with yeast and laminated prior to cutting and baking. The combination of flour protein modification, achieved during fermentation, and lamination gives rise to the characteristic flaky and blistered biscuits.

2. Soda crackers

The soda cracker is a square biscuit about 50x50mm and 4mm thick. Each biscuit weighs about 3-3.5g and the moisture content is about 2.5%. The biscuits are produced with scrapless cutters so the edges are white and broken after baking.

Sodium bicarbonate added as the cracker should be alkaline after baking (pH 7.2 –8.0).

3. Savoury or snack crackers:

This type of biscuit are salted, flavoured and fat sprayed after baking. Depending upon their size, they are regarded as savoury snacks, nibbles or biscuits from cheese. They are characterized by open textures and soft eating mouth feel. Sometimes they may be cream sandwiched with a savoury, non-sweet cream based on cheese powder. Many savoury crackers are decorated with poppy, sesame or celery seeds and garnished with salt. These materials are applied after cutting and before baking. All savoury crackers are baked on some form of wire to allow maximum and quick development of structure.

4. Water biscuits and matzos:

Matzos are made from flour and water only, and water biscuits have a little fat added. The shape of matzos varies, either conventionally round or rectangular like water biscuits, or in large sheets which are broken up by the consumer.

Typically the matzo recipe is about 100 parts of flour to 38 parts of water. This mixture is gently rolled together in mixer to form a crumbly dough, then baked for a very short time in a very hot oven. Baking times of around one minute at 400^0C are common.

5. Puff biscuits

The dough is not fermented and is invariably cold and underdeveloped. The methods for distributing the fat in the dough determines the type of mixers and laminators needed. The eating quality of puff biscuits is determined very largely by the nature of the fat used for laminating. Unlike puff pastry for sausage rolls which are best eaten hot, puff biscuits are eaten cold. Puff biscuits may be used as unsweetened carriers for butter, cheese, jam etc or

as shells for sweet or savoury cream sandwiches. The molten sugar glaze frequently found on puff biscuits results from fine sugar melting during baking.

6. Hard Sweet, Semi Sweet & Garibaldi Fruit Sandwich Biscuit

All biscuits in this group are characterized by doughs which contain a well developed gluten network with high amounts of sugar and fat , the gluten becomes less elastic and more extensible. The most common method of dough preparation involves vigorous or extended mixing to produce a developed dough. As a result of the mixing action heat is developed. Dough is used at 35–40°C.

Semi sweet biscuits are basic biscuits and significant in the market due to its low cost, particularly in developing countries. Hard sweet biscuit has varieties of biscuits, cookies, crackers which differ in taste, shape, decoration and other unique features which bakers add to differentiate their uniqueness.

Garibaldi biscuits: The Garibaldi biscuit consists of currants squashed between two thin, oblong Biscuit- a currant sandwich. Popular with British consumers as a snack for nearly 150 years, the Garibaldi biscuit is conventionally consumed with tea or coffee, into which it may be soaked and eaten.

7. Short Dough Biscuits

Products in this group are made from a dough that lacks extensibility and elasticity. The structure of the baked biscuit consists of a mixture of protein, starch and sugar glass (super cooled molten sugar). The texture is coarse. Many short doughs are formed with a rotary

moulder. Based on quality of fat the flavor is imparted to the biscuit. It is recommended that there are at least 15-20% fat solids at the dough temperature.

Conclusion: Biscuit is one processed wheat product which has found acceptability in rural areas in our country. The raw materials for biscuits are flour, sugar and shortening. For protein enriched biscuits, soy flour or peanut flour or protein isolate is added at 15-25 percent levels. Based on the methods of dough preparation the pastry dough, creamed dough, egg white mixture, egg dough and dough rich in honey and other sugar syrups results in variety of biscuits.This snack is most popular and accepted among every age group irrespective of region anywhere in the world.The demand for more varieties of taste,texture and speciality biscuits is ever growing.

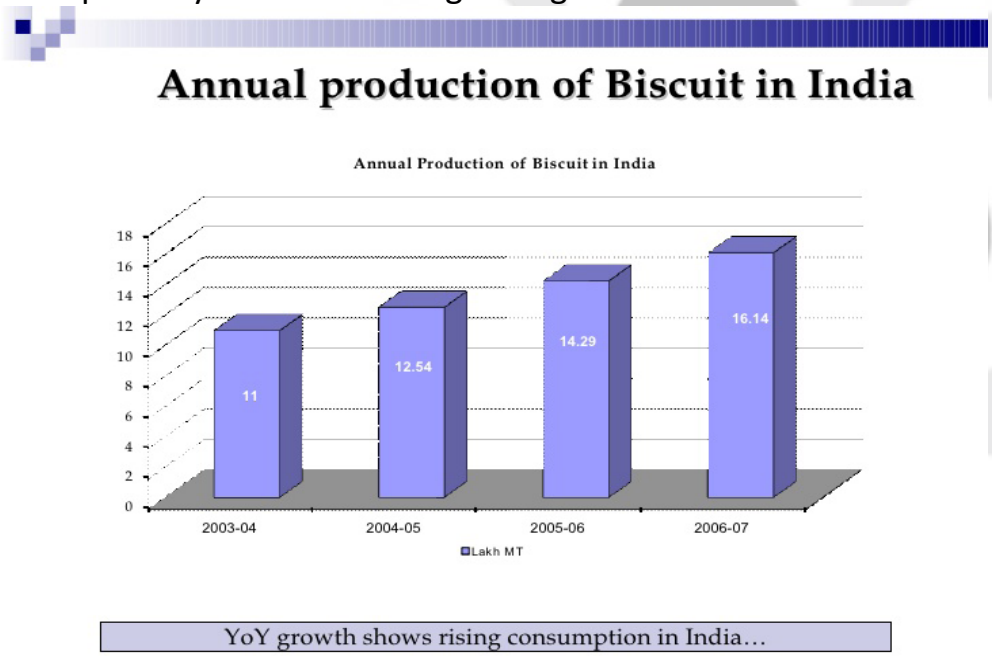

Fig 1 Annual production of Biscuit in India

Table 1. Formulae for Sweet, Salty and Protein Enriched Biscuits

Ingredients	Sweet (Parts)	Salt (Parts)	Protein Enriched (Parts)
Soft wheat flour	100	100	100
Shortening	10	10	10
Cane sugar	20	5	20
Salt	-	0.6	-
Skim milk powder/Soybean flour or peanut flour	-	-	30
Sodium bicarbonate	0.4	0.4	0.4
Ammonium carbonate	0.2	0.2	0.2
Flavor	0.1	0.2	1.2
Calcium phosphate	-	-	0.5
Vitamin premix	-	-	1.2

Table 2. Composition of wheat flour for biscuits

Contents wheat flour	Weak/medium flour	Strong flour
Starch	74.5	71.5
Moisture	14.0	13.5
Proteins (gluten forming)	7.0	10.0
Proteins (soluble)	1.0	1.0
Sugar	2.0	2.5
Fat	1.0	1.0
Total	100.0	100.0

Table 3 : Sugar specifications for biscuits

Moisture content	0.06% maximum
Ash content	0.03% maximum
Powdered sugar	60µm
Crystal sugar	150µm
Caster sugar	150 – 450µm
Granulated sugar	450 – 600µm
Brown sugar, a dry golden brown sugar with bold crystals.	
Particle size	0.8 – 1.2 mm