



EIILM UNIVERSITY
S I K K I M

BAKERY & CONFECTIONERY

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Chapter 1

Bakery

Bakery window with breads and cakes on display, 1936

A **bakery** (or **baker's shop**) is an establishment that produces and sells flour-based food baked in an oven such as bread, cakes, pastries, and pies. Some retail bakeries are also cafés, serving coffee and tea to customers who wish to consume the baked goods on the premises.

Some bakery shops provide services for special occasions such as weddings, birthday parties, anniversaries, or even business events. Bakery shops can provide a wide range of cakes designs such as sheet cakes, layer cakes, tiered cakes, and wedding cakes. Other bakeries may specialize in traditional or hand made types of bread made with locally milled flour, without flour bleaching agents or flour treatment agents, baking what is sometimes referred to as artisan bread.

While grocery stores and supermarkets in many countries now carry prepackaged, pre-sliced bread and cakes, or offer in store baking and basic cake decoration, some people may prefer to get their baked goods from a specialist baker's shop, either out of tradition, for the availability of a greater variety of baked goods, or from the higher quality practice of the trade of baking.

Baker

A **baker** is someone who makes, bakes and sells breads, rolls, biscuits or cookies, and/or crackers using an oven or other concentrated heat source. Cakes and similar foods may also be produced, as the traditional boundaries between what is produced by a baker as opposed to a pastry chef have blurred in recent decades. The place where a baker works is called a **bakery**.

Origin

The first group of people to bake bread was ancient Egyptians, around 8000 BC. During the middle Ages it was common for each landlord to have a bakery, which was actually a public oven; Housewives would bring dough that they had prepared to the baker, who would tend the oven and bake them into bread. As time went on, bakers would also sell their own goods, and in that some bakers acted dishonestly, tricks emerged: for example, a baker might have trap door(s) in the oven or other obscured areas, that would allow a hidden small boy or other apprentice to

take off some of the dough brought in for baking. Then the dishonest baker would sell bread made with the stolen dough as their own. This practice and others eventually lead to the famous regulation known as Assize of Bread and Ale, which prescribed harsh penalties for bakers that were found cheating their clients or customers. As a safeguard against cheating, under-filled orders, or any appearance of impropriety, bakers commonly began to throw in one more loaf of bread; this tradition now exists in the phrase "baker's dozen", which are 13.

Modern bakers

Today bakers work in varying environments both as employees and sometimes owning their own stores. Bakers can be found working in:

- **Large factories.** These produce bread and related products which are then transported to numerous sale or consumption points throughout a region. These normally include supermarkets, restaurants, various fast food outlets, convenience stores, and the like. Bakers in these environments are largely there for quality control as machines take care of much of the labor intensive aspect of the job.
- **Small Independent bakeries.** These are largely family-run businesses. They may specialize in particular types of products, such as rye bread, sourdough, bread, French, pita bread or bagels. They may supply nearby restaurants, grocers, or delicatessens with particular style(s) of bread. Independent bakeries often sell directly to the public from a store or counter at the bakery.
- **Chain stores.** Recent years have seen the rise of chain stores selling the same range of products. Bakers in these stores bake according to a pre-determined recipe book. This can lead to frustration as some bakers do not agree with techniques used by the franchising model. However, the recipes used tend to be well-founded, and popular with the paying public.
- **Restaurants** in which bakers may work exclusively to produce fresh high quality baked goods to be served as part of a menu.

Baker percentage

Baker's percentage is a baker's notation method indicating the flour-relative proportion of an ingredient used when making breads, cakes, muffins, and other pastries. It is also referred to as **baker's math**, or otherwise contextually indicated by a phrase such as **based on flour weight**. It is sometimes called *formula percentage*, a phrase that refers to the sum of a set of bakers' percentages. Baker's percentage expresses each ingredient in parts per hundred as a ratio of the ingredient's mass to the total flour's mass (that is, the unit mass):

$$\text{baker's percentage}_{\text{ingredient}} = 100\% \times \frac{\text{mass}_{\text{ingredient}}}{\text{mass}_{\text{flour}}}$$

For example, in a recipe that calls for 10 pounds of flour and 5 pounds of water, the corresponding baker's percentages are 100% for the flour and 50% for the water. Because these percentages are stated with respect to the mass of flour rather than with respect to the mass of all ingredients, the total sum of these percentages always exceeds 100%.

Flour-based recipes are more precisely conceived as baker's percentages, and more accurately measured using mass instead of volume. The uncertainty in using volume measurements follows from the fact that flour settles in storage and therefore does not have a constant density.

Baker percentages

A yeast-dough formula could call for the following list of ingredients, presented as a series of baker's percentages:

flour	100%
water	35%
milk [†]	35%
fresh	4% ^{††}

yeast	
salt	1.8%

Conversions

There are several main conversions that are used with baker's percentages. Converting baker's percentages to ingredient weights is one. Converting known ingredient weights to baker percentages is another. Conversion to true percentages, or based on total weight, is helpful to calculate an unknown flour weight from a desired total or formula weight.

Using baker percentages

To derive the ingredient weights when any weight of flour is chosen:

$$weight_{ingredient} = \frac{weight_{flour} \times baker's\ percentage_{ingredient}}{100\%}$$

In the example below, 2 lb and 10 kg of flour weights have been calculated. Depending on the desired weight unit, only one of the following four weight columns is used:

Creating baker's percentages

The baker has determined how much a recipe's ingredients weigh, and uses uniform decimal weight units. All ingredient weights are divided by the flour weight to obtain a ratio, then the ratio is multiplied by 100% to yield the baker's percentage for that ingredient:

Due to the canceling of uniform weight units, the baker may employ any desired system of measurement (metric or avoirdupois, etc.) when using a baker's percentage to determine an ingredient's weight. Generally, the baker finds it easiest simply to use the system of measurement that is present on the available tools.

Formula percentage and total mass

The total or sum of the baker's percentages is called the formula percentage. The sum of the ingredient masses is called the formula mass (or formula "weight"). Here are some interesting calculations:

The flour's mass times the formula percentage also equals the formula mass

$$\text{formula mass} = \text{mass}_{\text{flour}} \times \text{formula percentage}$$

An ingredient's mass is obtained by multiplying the formula mass by that ingredient's true percentage; because an ingredient's true percentage is that ingredient's baker's percentage divided by the formula percentage, an ingredient's mass can also be obtained by multiplying the formula mass by the ingredient's baker's percentage and then dividing the result by the formula percentage:

$$\begin{aligned} \text{mass}_{\text{ingredient}} &= \text{formula mass} \times \text{true percentage}_{\text{ingredient}} \\ \text{true percentage}_{\text{ingredient}} &= \frac{\text{baker's percentage}_{\text{ingredient}}}{\text{formula percentage}} \\ \text{mass}_{\text{ingredient}} &= \text{formula mass} \times \frac{\text{baker's percentage}_{\text{ingredient}}}{\text{formula percentage}} \\ &= \frac{\text{formula mass} \times \text{baker's percentage}_{\text{ingredient}}}{\text{formula percentage}} \end{aligned}$$

Thus, it is not necessary to calculate each ingredient's true percentage in order to calculate each ingredient's mass, provided the formula mass and the baker's percentages are known.

Weights and densities

The use of customary U.S. units can sometimes be awkward and the metric system makes these conversions simpler. In the metric system, there are only a small number of basic measures of relevance to cooking: the gram (g) for weight, the liter (L) for volume, the meter (m) for length, and degrees Celsius (°C) for temperature; multiples and sub-multiples are indicated by prefixes, two commonly used metric cooking prefixes are milli- (m-) and kilo- (k-). Intra-metric conversions involve moving the decimal point.

Common avoirdupois and metric weight equivalences:

$$1 \text{ pound (lb)} = 16 \text{ ounces (oz)}$$

$$1 \text{ kilogram (kg)} = 1000 \text{ grams (g)} = 2.20462262 \text{ lb}$$

$$1 \text{ lb} = 453.59237 \text{ g} = 0.45359237 \text{ kg}$$

$$1 \text{ oz} = 28.3495231 \text{ g.}$$

In four different English-language countries of recipe and measuring-utensil markets, approximate cup volumes range from 236.59 to 284.1 milliliters (mL). Adaptation of volumetric recipes can be made with density approximations:

Due to volume and density ambiguities, a different approach involves volumetrically measuring the ingredients, then using scales or balances of appropriate accuracy and error ranges to weigh them, and recording the results. With this method, occasionally an error or outlier of some kind occurs.

Drawbacks

Baker's percentages do not accurately reflect the impact of the amount of gluten-forming proteins in the flour on the final product and therefore may need to be adjusted from country to country, or even miller to miller, depending on definitions of terms like "bread flour" and actual protein content. Manipulation of known flour-protein levels can be calculated with a Pearson square.

In home baking, the amounts of ingredients such as salt or yeast expressed by mass may be too small to measure accurately on the scales used by most home cooks. For these ingredients, it may be easier to express quantities by volume, based on standard densities. For this reason, many bread making books that are targeted to home bakers provide both percentages and volumes for common batch sizes.

Besides the need for appropriate scales, a kitchen calculator is helpful when working directly from baker's percentages.

Advantages

Baker's percentages enable the user to:

Compare recipes more easily (i.e., which are drier, saltier, sweeter, etc.).

Spot a bad recipe, or predict its baked characteristics.

Alter or add a single-ingredient percentage without changing the other ingredients' percentages.

Measure uniformly an ingredient where the quantity per unit may vary (as with eggs).

Scale accurately and easily for different batch sizes.

Common Formulations

Common formulations for bread include 100% flour, 60% water/liquid, 1% yeast, 2% salt and 1% oil, lard or butter. In a recipe, the baker's percentage for water is referred to as the "hydration"; it is indicative of the stickiness of the dough and the "crumb" of the bread. Lower hydration rates (e.g., 50–57%) are typical for bagels and pretzels, and medium hydration levels (58–65%) are typical for breads and rolls. Higher hydration levels are used to produce more and larger holes, as is common in artisan breads such as baguettes or Ciabatta.

Chapter 2

Bread Machine

Bread making machine or bread maker is a home appliance for baking bread. It consists of a bread pan (or "tin"), at the bottom of which are one or more built-in paddles, mounted in the center of a small special-purpose oven. This small oven is usually controlled by a simple built-in computer, the settings for which are inputted at a control panel. Most bread machines have different cycles for different kinds of dough—including white bread, whole grain, European-style (sometimes labeled "French"), and dough-only (for pizza dough and shaped loaves baked in a conventional oven). Many also have a timer to allow the bread machine to activate without operator attendance, and some high-end models allow the user to program a custom cycle.

History

The first bread maker was released in Japan in 1986 by the Matsushita Electric Industrial Co. (now Panasonic). A decade later they had become popular in the United Kingdom, Australia and the United States. While not viable for commercial use due to the fixed loaf shape and the limited duty cycle, bread machines are very suitable for home use, producing their best results when dealing with kneaded dough.

Use and features

To create a loaf of bread, ingredients are measured into the bread pan in a specified order (usually liquids first, with solid ingredients layered on top) and the pan is then placed in the bread maker. The order of ingredients is important because the instant yeast used in bread makers is activated by contact with water, so the yeast and the water must be kept apart until the program starts.

The machine takes a few hours to make a loaf of bread, first by turning the ingredients into dough using the paddle, proofing the loaf using ideal temperature control, then baking the loaf. Once the bread has been baked, the pan is extracted from the bread maker and the bread freed from the pan. The paddle, now at the bottom of the loaf, is removed, leaving a small paddle-shaped indentation or hole. The shape of the finished loaf is often considered unusual, with many early bread machines producing a vertically oriented, square or cylindrical loaf very different

from commercial breads; however, more recent units generally have a more traditional-appearing horizontal pan.

Bread machine recipes are often somewhat smaller than standard bread recipes, and are sometimes standardized based on the capacity of the machine's pan; most common in the United States market are 1.5 lb/700g units, and the majority of recipes are written for that capacity; however, 2 lb/900g units are not uncommon either. Packaged bread mixes are available, specifically designed for bread makers, containing premeasured ingredients including flour and yeast, as well as flavorings and occasionally dough conditioners. Only water usually needs to be added. Bread machines generally do not deal well with non-wheat flours, so any recipe that requires a substantial addition of a grain such as rye or corn that lacks gluten will prove difficult at best in a bread machine, as will any dough with unusually large amounts of liquid (such as ciabatta).

Generally, homemade bread goes stale faster than bread from a commercial baker because the former does not include preservatives. However, it is possible (though rather difficult) to use a natural leaven or a pre-ferment in bread maker dough recipes if the starter is sufficiently fast to rise. Sourdough contains a symbiotic culture of yeast and lacto bacteria; the yeast provides some flavor as well as carbon dioxide to provide lift, while lactic acid produced by sourdough's lacto bacteria greatly preserves bread, as well as affecting its flavor, while pre-ferments provide some of the same benefits as a sourdough culture with the greater predictability of domesticated baker's yeast.

Bread makers are often equipped with a timer to control when the bread making begins. This allows them, for example, to be loaded in the evening but only begin baking early in the morning, to produce a freshly baked loaf for breakfast. They can also be set only to make dough, for instance to be used to make pizza. Some can also be set to make other things besides bread, such as jam, pasta dough, don or mochi, a kind of Japanese rice cake. One of the most recent innovations is the facility to add nuts and fruit during the kneading process automatically from a tray.

Traditionally, bread makers take between three and four hours to bake a loaf. However recently "fast bake" modes have become common additions, many of which are able to produce a loaf in under an hour. The bread is generally not of as good quality as that produced by a longer program, but for many users this is a useful feature.

Convenience cooking

Convenience cooking is the practice of streamlining recipes for simplicity and speed of preparation. It is a common practice in Western cultures, where both men and women work outside the home and elaborate meals are difficult if not impossible to pull off given the time constraints. Though seemingly a recent phenomenon, guides to convenience cooking go as far back as 1930 French Cooking in Ten Minutes by Edouard de Pomiane, which tried to minimize the time put into much French cooking of the day.

Current well-known practitioners of the art include Rachael Ray and Sandra Lee; in addition, Cook's Illustrated magazine has often incorporated convenience-cooking principles into their recipes.

Ingredient simplification

A significant amount of convenience cooking revolves around simplifying recipes to five or fewer ingredients. There is a substantial genre of cookbooks devoted to such dishes, often, though not always using other prepared foods as ingredients. In this division, "ingredients" generally does not include such things as spices and water.

Time economy

Another important skill in convenience cooking is time management. This genre of cooking focuses largely on process and technique rather than ingredients, and is aimed at getting the best quality out of a quickly prepared meal as possible, especially using common kitchen tools rather than specialized equipment such as convection ovens and microwave ovens. Some recipes remove certain steps that take large amounts of time. Sometimes kneading dough is removed from the process of making bread because it requires large amounts of time and effort.

A common adjunct to this school of food preparation is the slow cooker, which allows unattended Preparation of braises, soups, and stews.

Cake shop

A **cake shop** is a retail business specializing in cakes. It is the English culture equivalent to a French patisserie.

Cake shops may also sell equipment and supplies for home cake baking, especially for cake decorating, but not all do this. Another common but not universal sideline is special orders such as wedding cakes and elaborate birthday cakes.

Cake decorating

Cake decorating is art that is performed in places all over the world. That is why contests and baking show competitions are very popular, especially in the Western World. Cake decorating is one of the sugar arts that uses icing or frosting and other edible decorative elements to make plain cakes more visually interesting. Alternatively, cakes can be molded and sculpted to resemble three-dimensional persons, places and things.

In many areas of the world, decorated cakes are often a focal point of a special celebration (such as a birthday, graduation, bridal shower, wedding, or anniversary), or are given as gifts. They can also mark national or religious holidays, or be used to promote commercial enterprises.

Cake themes

There are many themes of cakes, such as wedding cakes, birthday cakes, seasons, and holidays. Cakes may be baked and decorated for almost any social occasion.

History

During the 1840s, the advent of temperature-controlled ovens and the production of baking soda and baking powder made baking cakes much easier.

Even though baking from scratch decreased during the latter part of the 20th century in the United States, decorated cakes have remained an important part of celebrations such as weddings, anniversaries, birthdays, showers and other special occasions. Recently, cakes decorated with fondant have become extremely popular and resulted in several reality based TV shows across the country.

Cake decorating as an art

Decorating a cake usually involves covering a cake with some form of icing and then using decorative sugars, candies, chocolate or icing decorations to embellish the cake. But it can also be as simple as sprinkling a fine coat of icing sugar or drizzling a glossy blanket of glaze over the top of a cake. Icing decorations can be made by either piping icing flowers and decorative borders or by molding gum paste, fondant, or marzipan flowers and figures. Fondant allows the baker to express creativity in baking. Fondant exists in many different colors, and its initial form is soft and easy to handle. In this form, cake decorators are able to mold fondant into many different artistic expressions. Many of these art expressions are also taught in professional cake decorating class. Fondant is primarily used to cover cakes but is also used to create individual show pieces for cakes. Gum paste is a substance used in cake decorating to create flower decorations. Royal Icing is a sweet white icing made by whipping fresh egg whites (or powdered egg whites, meringue powder) with icing sugar. Royal icing produces well-defined icing edges and is ideal for piping intricate writing, borders, scrollwork and lacework on cakes. It dries very hard and preserves indefinitely if stored in a cool, dry place, but is susceptible to soften and wilt in high humidity. Marzipan is often used for modeling cake decorations and as a base covering underneath fondant. Professional institutes, such as the London Culinary Institute and Le Cordon Bleu, have begun segregating their cookery schools to create completely separate institutes, dedicated to cake making.

Chapter 3

Pâtisserie

A **Pâtisserie** is the type of French or Belgian bakery that specializes in pastries and sweets. In both countries it is a legally controlled title that may only be used by bakeries that employ a licensed maître pâtissier (master pastry chef).

In France and Belgium the pâtissier is a pastry chef who has completed a lengthy training process, typically an apprenticeship, and passed a written examination. Often found in partnership with a boulangerie, pâtisseries are a common sight in towns and villages in France.

In Korea the term pâtissier is used as well.

In France and Canada, the term pâtisserie also refers to the pastries produced by apâtissier. Mass-produced pastries are also sometimes called pâtisserie.

In Australia, pâtisserie is used commonly along with the words bakery or pastry shop.

Baker's yeast

Baker's yeast is the common name for the strains of yeast commonly used as a leavening agent in baking bread and bakery products, where it converts the fermentable sugars present in the dough into carbon dioxide and ethanol. Baker's yeast is of the species *Saccharomyces cerevisiae*, which is the same species (but a different strain) commonly used in alcoholic fermentation which is called **brewer's yeast**. Baker's yeast is also a single-celled microorganism found on and around the human body.

The use of steamed or boiled potatoes, water from potato boiling, or sugar in a bread dough provides food for the growth of yeasts; however, too much sugar will dehydrate them. Yeast growth is inhibited by both salt and sugar, but more so with salt than sugar. Fats, such as butter or eggs, slow down yeast growth; however, others say the effect of fat on dough remains unclear, presenting evidence that small amounts of fat are beneficial for baked bread volume. *Saccharomyces exiguus* (also known as *S. minor*) is a wild yeast found on plants, fruits, and

grains that is occasionally used for baking; it is not, however, generally used in a pure form, but comes from being propagated in a sour dough starter.

History

It is not known when yeast was first used to bake bread; the earliest definite records come from Ancient Egypt. Researchers speculate that a mixture of flour meal and water was left longer than usual on a warm day and the yeasts that occur in natural contaminants of the flour caused it to ferment before baking. The resulting bread would have been lighter and tastier than the previous hard flatbreads. It is generally assumed that the earliest forms of leavening were likely very similar to modern sourdough; the leavening action of yeast would have been discovered from its action on flatbread dough, and would either have been cultivated separately or transferred from batch to batch by means of previously mixed ("old") dough. Alternatively, the development of leavened bread seems to have developed in close proximity to the development of beer brewing, and barm from the beer fermentation process can also be used in bread making.

Without an understanding of microbiology, early bakers would have had little ability to directly control yeast cultures, but still kept locally interesting cultures by reusing doughs and starters to leaven later batches. However, it became possible to isolate and propagate favored yeast strains in the same manner as was done in the beer industry, and it eventually became practical to propagate yeast in a slurry with a composition similar to beer wort, usually including malted barley and wheat flour. Such cultures (sometimes referred to in old American cookery as "emptins", from their origins as the dregs of beer or cider fermentation) would become the ancestors of modern baker's yeast, as they generally were carefully maintained to avoid what would later be discovered to be bacterial contamination, including using preservatives such as hops as well as boiling the growth medium.

In the 19th century, bread bakers obtained their yeast from beer brewers, and this led to sweet-fermented breads such as the Imperial "Kaiser-Semmel" roll, which generally lacked the sourness created by the acidification typical of *Lactobacillus*. However, beer brewers slowly switched from top-fermenting to bottom-fermenting yeast (both *S. cerevisiae*) and this created a shortage of yeast for making bread, so the Vienna Process was developed in 1846. While the innovation is often popularly credited for using steam in baking ovens leading to a different crust

characteristic, it notably included procedures for high milling of grains (see Vienna grits), cracking them incrementally instead of mashing them with one pass; as well as better processes for growing and harvesting top-fermenting yeasts, known as press-yeast.

Refinements in microbiology following the work of Louis Pasteur led to more advanced methods of culturing pure strains. In 1879, Great Britain introduced specialized growing vats for the production of *S. cerevisiae*, and in the United States around the turn of the century centrifuges were used for concentrating the yeast,[13] making modern commercial yeast possible, and turning yeast production into a major industrial endeavor. The slurry yeast made by small bakers and grocery shops became cream yeast, a suspension of live yeast cells in growth medium, and then compressed yeast, the fresh cake yeast that became the standard leaven for bread bakers in much of the Westernized world during the early 20th century.

During World War II, Fleischmann's developed a granulated active dry yeast for the United States armed forces, which did not require refrigeration and had a longer shelf life and better temperature tolerance than fresh yeast; it is still the standard yeast for US military recipes. The company created yeast that would rise twice as fast, cutting down on baking time. Lesaffre would later create instant yeast in the 1970s, which has gained considerable use and market share at the expense of both fresh and dry yeast in their various applications.

Types of baker's yeast

Baker's yeast is available in a number of different forms, the main differences being the moisture contents. Though each version has certain advantages over the others, the choice of which form to use is largely a question of the requirements of the recipe at hand and the training of the cook preparing it. Dry yeast forms are good choices for longer-term storage, often lasting several months at room temperatures without significant loss of viability. With occasional allowances for liquid content and temperature, the different forms of commercial yeast are generally considered interchangeable.

- **Cream yeast** is the closest form to the yeast slurries of the 19th century, being essentially a suspension of yeast cells in liquid, siphoned off from the growth medium. Its primary use is

in industrial bakeries with special high-volume dispensing and mixing equipment, and it is not readily available to small bakeries or home cooks.

Compressed yeast is essentially cream yeast with most of the liquid removed. It is a soft solid, beige in color, and arguably best known in the consumer form as small, foil-wrapped cubes of **cake yeast**. It is also available in larger-block form for bulk usage. It is highly perishable; though formerly widely available for the consumer market, it has become less common in supermarkets in some countries due to its poor keeping properties, having been superseded in some such markets by active dry and instant yeast. It is still widely available for commercial use, and is somewhat more tolerant of low temperatures than other forms of commercial yeast; however, even there, instant yeast has made significant market inroads.

- **Active dry yeast** is the form of yeast most commonly available to noncommercial bakers in the United States. It consists of coarse oblong granules of yeast, with live yeast cells encapsulated in a thick jacket of dry, dead cells with some growth medium. Under most conditions, active dry yeast must first be proofed or rehydrated. It can be stored at room temperature for a year, or frozen for more than a decade, which means that it has better keeping qualities than other forms, but it is generally considered more sensitive than other forms to thermal shock when actually used in recipes.

A single grain of active dry yeast. The numbered ticks on the scale are 230 μm apart

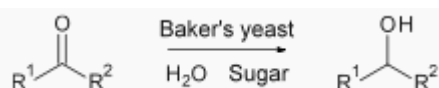
- **Instant yeast** appears similar to active dry yeast, but has smaller granules with substantially higher percentages of live cells per comparable unit volumes. It is more perishable than active dry yeast, but also does not require rehydration, and can usually be added directly to all but the driest dough's. Instant yeast generally has a small amount of ascorbic acid added as a preservative. Some producers provide two or more forms of instant yeast in their product portfolio; for example, LeSaffre's "SAF Instant Gold" is designed specifically for doughs with high sugar contents. These are more generally known as **osmo tolerant** yeasts.
- **Rapid-rise yeast** is a variety of dried yeast (usually a form of instant yeast) that is of a smaller granular size, thus it dissolves faster in dough, and it provides greater carbon dioxide output to allow faster rising. There is considerable debate as to the value of such a product; while most baking experts believe it reduces the flavor potential of the finished

product, Cook's Illustrated magazine, among others, feels that at least for direct-rise recipes, it makes little difference. Rapid-rise yeast is often marketed specifically for use in bread machines.

For most commercial uses, yeast of any form is packaged in bulk (blocks or freezer bags for fresh yeast; vacuum-packed brick bags for dry or instant); however, yeast for home use is often packaged in pre-measured doses, either small squares for compressed yeast or sealed packets for dry or instant. For active dry and instant yeast, a single dose (reckoned for the average bread recipe of between 500 g and 1000 g of dough) is generally about 2.5 tsp (~12 mL) or about 7 g (1/4 ounce), though comparatively lesser amounts are used when the yeast is used in a pre-ferment. A yeast flavor in the baked bread is generally not noticeable when the bakers' percent of added yeast is less than 2.5.

Use in research

Because it is readily available and easy to culture, baker's yeast has long been used in chemical, biological, and genetic research. In 1996, after 6 years of work, *S. cerevisiae* became the first eukaryote to have its entire genome sequenced. It has over 12 million base pairs and around 6000 genes. Since then it has remained in the forefront of genetic research. For example, most of our knowledge of the cell division cycle was worked out from experiments with yeast.



Reduction of a carbonyl to a hydroxyl with baker's yeast.

Baker's yeast contains enzymes which can reduce a carbonyl group into a hydroxyl group in fairly high yield, thus making it a useful bio-reagent in chemical syntheses. It is known to reduce organo metallic carbonyl compounds in very high yield. Baker's yeast can also be used to produce ethanol via fermentation for use in chemical synthesis, although doing so in some places requires permits. Baker Yeast also used in the bio-remediation of Arsenic (III) from the ground water which a toxic Pollutants.

Chapter 4

Chorleywood Bread Process

The **Chorleywood bread** process is a high-volume process of making dough in bread production. The CBP, or no time method, was developed in 1961 by the British Baking Industries Research Association based at Chorleywood, and is now used to make 80% of the UK's bread. Compared to the older bulk fermentation process, the CBP is able to use lower protein wheat, and produces bread in a shorter time.

CBP is able to use lower protein wheat because some protein is lost during bulk fermentation of traditional bread; this does not occur to the same degree in mechanically developed doughs.

The process had an important impact in the United Kingdom, as at the time, few domestic wheat varieties were of sufficient quality to make high quality bread products, and it therefore permitted a much greater proportion of lower-protein domestic wheat to be used in the grist.

Details

The Chorleywood bread process allows the use of lower-protein wheat's and reduces processing time, the system being able to produce a loaf of bread from flour to sliced and packaged form in about three-and-a-half hours. This is achieved through the addition of ascorbic acid (Vitamin C), fat, yeast, and intense mechanical working by high-speed mixers. The last requirement means that it is difficult to reproduce CBP in a small-scale kitchen.

The CBP is only a method of producing quick-ripened bread dough. Large-scale bread-making with automated processes pre-dates the CBP by at least a century.

Flour, water, yeast, salt, fat, and, where used, minor ingredients common to many bread-making techniques such as Vitamin C, emulsifiers and enzymes are mechanically mixed for about three minutes.

The high-shear mixing generates high temperatures in the dough, which is cooled in some advanced mixers using a cooling jacket. Chilled water or ice may also be used to counteract the

temperature rise during high-speed mixing. Air pressure in the mixer headspace can be controlled to keep gas bubbles at the desired size and number. Typical operating regimes are pressure followed by vacuum and atmospheric followed by vacuum. The pressure control during mixing affects the fineness of crumb texture in the finished bread.

In typical high-volume bread-production, the dough is cut (divided) into individual pieces and allowed to "recover" for 5–8 minutes (intermediate proofing). Each piece of dough is then shaped (moulded), placed in a baking tin and moved to the humidity- and temperature-controlled proofing chamber, where it sits for about 45–50 minutes. It is now ready to be baked. Baking takes 17–25 minutes at 450 °F (about 230 °C). After baking, the loaves are removed from the baking tin (de-panning) and then go to the cooler, where, about two hours later, they are, where necessary, sliced and packaged and ready for despatch. In UK-standard bread, the dough piece is "cross-panned" at the moulding stage; this involves cutting the dough piece into four and turning each piece by 90° before placing it in the baking tin. Cross-panned bread appears to have a finer and whiter crumb texture than the elliptical shape of the crumb bubble structure is seen from a different orientation. Cross-panned bread is easier to slice.

Adoption

CBP is used in over 80 percent of factory-produced bread in the United Kingdom, Australia, New Zealand and India. Many smaller bakers also use the CBP to mix their dough which they then process by hand. Many "speciality", "crusty", and organic breads are produced this way. The CBP is only minimally used in the United States, largely due to the "strong" high protein wheats grown in North America that do not require such intensive mixing.

Modern use

Since the introduction of the process, many UK domestic wheat varieties have been improved. Flour suitable for traditional high quality pan bread (11.5% - 13.5% protein) can now be sourced in the United Kingdom. Prior to the CBP, UK bread was hugely reliant on imported wheat, particularly from North America.

Other processes

- Batch mixing bread process, method currently used in US.

- Continuous mixing bread process, popularized with Wonder Bread in the 1970s
- Aerated Bread Company, an English bread company which operated from in 1862 to the 1980s, using carbon dioxide instead of yeast
- Vienna bread, early innovative European bread process

Coffee cake

Coffee cake is a common cake or sweet bread available in many countries. The term "coffee cake" can refer to any of the following:

- A class of cakes intended to be eaten alongside coffee (for example, as part of a breakfast meal) or that may be eaten during a "coffee break" or offered to guests as a gesture of hospitality on or around a coffee table. Under this definition, a coffee cake does not necessarily contain coffee. They are typically single layer cakes that may be square or rectangular like a Stollen or loaf-shaped rectangular cakes, or they may be ring shaped. Coffee cakes may be flavored with cinnamon or other spices, seeds, nuts and fruits. These cakes sometimes have a crumbly or crumb topping called streusel and/or a light glaze drizzle. Some similarity to teacakes may be found, though teacakes can be individually sized baked items served with tea.
- A cake, often sponge cake, which is made with coffee or has a coffee flavor.

Dough

Dough is a thick, malleable, sometimes elastic, paste made out of any cereals (grains) or leguminous crops. Dough is typically made by mixing flour with a small amount of water and/or other liquid, and sometimes includes yeast or other leavening agents as well as other ingredients such as various fats or flavorings.

The process of making and shaping dough is a precursor to making a wide variety of foodstuffs, particularly breads and bread-based items (e.g., crusts, dumplings), flatbreads, noodles, pastry, pizza, bread rolls, biscuits, cookies and similar items. This includes all kinds of breads or similar recipes made from maize, rice, sorghum, wheat, and other cereals or related crops used around the world.

Types of dough

Statue of a servant kneading dough, from Egypt, Old Kingdom, 5th Dynasty, c. 2494-2345 BCE

Doughs vary widely depending on ingredients, the kind of product being produced, the type of leavening agent, how the dough is mixed (whether quickly mixed or kneaded and left to rise), and cooking or baking technique. There is no formal definition of what makes dough, though most doughs have visco elastic properties.

Leavened or fermented dough, made from dry ground grain cereals or legumes mixed with water and yeast, are used all over the world to make various breads. Salt, oils or fats, sugars or honey and sometimes milk or eggs are also common ingredients in bread dough.

Flatbreads such as pita, lafa, lavash, matzah or matzo, naan, roti, sangak, tortilla, and yufka are made from dough and eaten in many parts of the world. Some flatbreads, such as naan, use leavening agents; others, such as matzo, do not. Crackers are also made from dough, and some (such as saltine crackers) are leavened.

Pasta and noodles are generally based on unleavened doughs that are worked until they are dry and smooth, and then shaped into their final form; these may be cooked immediately or dried before cooking.

Doughs with higher fat content develop less gluten, due to their lower water content and may be less elastic; these doughs are often called "short" by bakers, and include many cookie and pie crust doughs, such as shortcrust pastry.

In many parts of central India, people use the quick method of making an instant roasted dough ball or baati. In countries in the Sahel region of Africa, dough balls called aiysh or biya are made from sorghum or millet, and are ground and boiled.

So-called quick breads use leavening agents other than yeast, and include most cookies, cakes, biscuits, and more; these may be based on a batter or a dough.

Techniques

Yeast bread dough after rising, or "proofing", for 40 minutes

Techniques used in dough production depend on the type of dough and final product.

For yeast-based and sponge (such as sourdough) breads, a common production technique is the dough is mixed, kneaded, and then left to rise. Many bread doughs call for a second stage, where the dough is kneaded again, shaped into the final form, and left to rise a final time (or proofed) before baking. Kneading is the process of working a dough to produce a smooth, elastic dough by developing gluten.

Pasta is typically made from a dry dough that is kneaded and shaped, either through extrusion, rolling out in a pasta machine, or stretched or shaped by hand (as for gnocchi or dumplings). Pasta may be cooked directly after production (so-called "fresh pasta") or dried, which renders it shelf-stable.

Doughs for biscuits and many flatbreads which are not leavened with yeast are typically mixed but not kneaded or left to rise; these doughs are shaped and cooked directly after mixing.

While breads and other products made from doughs are often baked, some types of dough-based foods are cooked over direct heat, such as tortillas, which are cooked directly on a griddle. Fried dough foods are also common in many cultures.

Pancakes, waffles, some kinds of bar cookies such as brownies, and many cakes and quick breads (including muffins and the like) are often made with a semi-liquid batter of flour and liquid that is poured into the final shape, rather than a solid dough. Unlike bread dough, these batters are not stabilized by the formation of a gluten network.

Dabby-Doughs

Dabby-Doughs are a type of pastry. They are traditionally made using the remnants of dough leftovers from making a pie, although they can be prepared in large amounts by simply making a batch of pastry dough. The filling of a dabby-dough is typically a mixture of cinnamon and white sugar sprinkled on butter or margarine, rolled, sliced and baked.

There are many different names for this type of confection, including "cinnamon snails," "schnecken," "bumble bees," "pinwheels," "tuzzie-muzzies," "gobblies," "schmekels," "doo-dads" and "mock rugula".

Farinograph

In baking, a Farinograph measures specific properties of flour. It was first developed and launched in 1928. The Farinograph is a tool used for measuring shear (fluid) and viscosity of a mixture of flour and water. The primary units of the farinograph are Brabender Units, an arbitrary unit of measuring the viscosity of a fluid. The Farinograph is a variation of the Brabender Plastograph that has been specialized for the baking industry, and it is used around the world as an objective measurement of a variety of flours.

A baker can formulate end products by using the Farinograph's results to determine the following:

- Water absorption.
- Dough viscosity, including peak water to gluten ratio prior to gluten breakdown.
- Peak mixing time to arrive at desired water/gluten ratio.
- The stability of flour under mixing.
- The tolerance of flour's gluten.

Chapter 5

Method Use In Bakery

A baker can formulate end products by using the Farinograph's results to determine the following:

The farinograph is drawn on a curved graph with the vertical axis labeled in Brabender Units (BU) and the horizontal axis labeled as time in minutes. The graph is generally hockey-stick shaped, with the curve being more or less acute depending on the strength of the gluten in the flour.

1. Arrival Time (Absorption) - Absorption is the point chosen by the baking industry which represents a target water to flour ratio in bread. This ratio is marked at the 500 BU line and is taken as a rule of thumb for desired taste, texture, and dough performance during proofing and baking. All other measurements are based on this 500 BU standard. (For comparison, the accepted BU is 1000 or greater for noodles.

Thus on the graph above, Arrival time is the point on the graph where the top of the curve reaches the 500 BU point and indicates the rate of absorption (minutes/BU).

2. Peak time - Peak time is reached at the highest point on the curve, and indicates when the dough has reached its maximum viscosity before gluten strands begin to break down.

3. Mixing Tolerance Index (MTI) - MTI is found by taking the difference in BU between the peak time point (on the graph above 3 minutes, 30 seconds) and 5 minutes after peak time is reached. This is used by bakers to determine the amount that a dough will soften over a period of mixing. MTI may be expressed as a value in BU or as a percentage of BU lost over time ($\frac{BU^n - BU^{n-x}}{BU^n}$).

4. Departure Time - Departure time is defined as the point at which the top of the curve goes below the 500 BU line. This point is generally considered the point at which gluten is breaking down and dough has become over mixed.

5. Stability - Stability is the point between arrival time and departure time and generally indicates the strength of a flour (how much gluten a flour has and how strong it is).

The graph above is a gluten rich bread flour, as its stability time is relatively long and the MTI is still above the 500 BU line. A weaker flour, such as a cake or pastry flour with a much lower gluten content would have a much steeper decline after peak time.

Applications

The Farinograph is used worldwide by bakers and food technicians in building bakery formulations. The farinograph gives the baker a good snapshot of the flour's properties and how the flour will react in different stages of baking. It assists the baker in choosing the right flour to complete the job.

The industrial application of these 5 points is far reaching. A baker may use, for example, the arrival time as a bare minimum time when planning full product floor time for a batch of dough. A baker may also use MTI as guideline to judge the response of a dough to the addition of other ingredients. Peak time may be used as a target mix time for optimal gluten structure and resilience. Stability may be used as a method of determining desired cell structure before irreparable gluten breakdown occurs.

Flour

Three different kinds of wheat and rye flour. From left to right: wheat flour Type 550, wheat flour Type 1050, rye flour Type 1150

Flour is a powder which is made by grinding cereal grains, or other seeds or roots (like Cassava). It is the main ingredient of bread, which is a staple food for many cultures, making the availability of adequate supplies of flour a major economic and political issue at various times throughout history. Wheat flour is one of the most important ingredients in European, North American, Middle Eastern, Indian and North African cultures, and is the defining ingredient in most of their styles of breads and pastries.

While wheat is the most common base for flour, maize flour has been important in Meso American cuisine since ancient times, and remains a staple throughout the Americas. Rye flour is an important constituent of bread in much of central Europe, and rice can also be used in flour, though this is relatively uncommon.

Etymology

The English word for "flour" is originally a variant of the word "flower". Both derive from the Old French fleur or flour, which had the literal meaning "blossom," and a figurative meaning "the finest." The phrase "fleur de farine" meant "the finest part of the meal," since flour resulted from the elimination of coarse and unwanted matter from the grain during milling.

History

It was discovered around 6000 BC that wheat seeds could be crushed between simple millstones to make flour. The Romans were the first to grind seeds on cone mills. In 1879, at the beginning of the Industrial Era, the first steam mill was erected in London. In the 1930s, some flour began to be enriched with iron, niacin, thiamine and riboflavin. In the 1940s, mills started to enrich flour and folic acid was added to the list in the 1990s.

Degermed and heat-processed flour

An important problem of the industrial revolution was the preservation of flour. Transportation distances and a relatively slow distribution system collided with natural shelf life. The reason for the limited shelf life is the fatty acids of the germ, which react from the moment they are exposed to oxygen. This occurs when grain is milled; the fatty acids oxidize and flour starts to become rancid. Depending on climate and grain quality, this process takes six to nine months. In the late 19th century, this process was too short for an industrial production and distribution cycle. As vitamins, micro nutrients and amino acids were completely or relatively unknown in the late 19th century, removing the germ was a brilliant solution. Without the germ, flour cannot become rancid. Degermed flour became standard. Degermation started in densely populated areas and took approximately one generation to reach the countryside. Heat-processed flour is flour where the germ is first separated from the endosperm and bran, then processed with steam, dry heat or microwave and blended into flour again.

The FDA has been advised by several cookie dough manufacturers that they have implemented the use of heat-treated flour for their ready-to-bake cookie dough products" to reduce the risk of E. coli contamination.

Production

Milling of flour is accomplished by grinding grain between stones or steel wheels. Today, "stone-ground" usually means that the grain has been ground in a mill in which a revolving stone wheel turns over a stationary stone wheel, vertically or horizontally with the grain in between. Many small appliance mills are available, both hand-cranked and electric. The mill stones frequently rub against each other resulting in small stone particles chipping off and getting into flour, but they are removed before the flour is sold.

Modern mills

Rollermills soon replaced stone grist mills as the production of flour has historically driven technological development, as attempts to make gristmills more productive and less labor-intensive led to the watermill and windmill. These terms are now applied more broadly to uses of water and wind power for purposes other than milling. More recently, the Unifine mill, an impact-type mill, was developed in the mid-20th century.

Composition

Flour contains a high proportion of starches, which are a subset of complex carbohydrates also known as polysaccharides. The kinds of flour used in cooking include all-purpose flour, self-rising flour (known as self-raising outside North America), and cake flour including bleached flour. The higher the protein content the harder and stronger the flour, and the more it will produce crusty or chewy breads. The lower the protein the softer the flour, which is better for cakes, cookies, and pie crusts.

Unbleached flour

Unbleached flour is simply flour that has not undergone bleaching and therefore does not have the color of "white" flour. An example of this would be the Graham flour. Sylvester Graham was against using bleaching agents, which he considered unhealthy.

Bleached flour

"Refined flour" has had the germ and bran removed and is typically referred to as "white flour". "Bleached flour" is any refined flour with a whitening agent added.

Bleached flour is artificially aged using a bleaching agent, a maturing agent, or both. A bleaching agent would affect only the carotenoids in the flour; a maturing agent affects gluten development. A maturing agent may either strengthen or weaken gluten development.

The four most common additives used as bleaching/maturing agents in the USA at this time are:

Potassium bromate (will be listed as an ingredient/additive) - a maturing agent that strengthens gluten development. Does not bleach.

Benzoyl peroxide - bleaches. Does not act as a maturing agent - no effect on gluten

Ascorbic acid (Will be listed as an ingredient/additive, but seeing it in the ingredient list may not be an indication that the flour was matured using ascorbic acid but instead has had a small amount added as a dough enhancer) - Maturing agent that strengthens gluten development. Does not bleach.

Chlorine gas - both a bleaching agent and a maturing agent, but one that weakens gluten development. Chlorination also oxidizes starches in the flour, making it easier for the flour to absorb water and swell - this makes thicker batters and stiffer doughs. For bread, this is bad (because gluten is weakened and bread is heavily dependent on gluten formation), but for cakes, cookies, and biscuits, it's a good thing, because gluten development in these types of baked goods makes them tough. The modification of starches in the flour allows the use of wetter doughs (making for a moister end product) without destroying the structure necessary for light fluffy cakes and biscuits. Chlorinated flour allows cakes and other baked goods to set faster, rise better, the fat to be distributed more evenly, with less vulnerability to collapse.

Cake flours in particular are nearly always chlorinated. There is at least one flour labeled "unbleached cake flour blend" (marketed by King Arthur) that is not bleached, but the protein content is much higher than typical cake flour at about 9.4% protein (cake flour is usually around 6% to 8%). According to King Arthur, this flour is a blend of a more finely milled unbleached wheat flour and cornstarch, which makes a better end result than unbleached wheat flour alone (cornstarch blended with all purpose flour commonly substituted for cake flour when the latter is unavailable). The end product, however, is denser than would result from lower-protein, chlorinated cake flour.

All bleaching and maturing agents (with the possible exception of ascorbic acid) have been banned in the EU.

Bromation of flour in the USA has fallen out of favor and while it is not yet actually banned anywhere, few retail flours available to the home baker are bromated anymore.

Many flours packaged specifically for commercial bakeries are still bromated. Retail bleached flours marketed to the home baker are now mostly either treated via peroxidation or chlorine gas. Current information from Pillsbury is that their bleached flours are treated both with benzoyl peroxide and chlorine gas. Gold Medal states that their bleached flour is either treated with benzoyl peroxide OR it's treated with chlorine gas, but there is no way to tell which process has been used when you buy the flour at the grocery store.

Some other chemicals used as Flour treatment agents to modify color and baking properties include:

- chlorine dioxide (unstable to be transported in the U.S.)
- Calcium peroxide
- Azodicarbonamide or azobisformamide (synthetic)

- Atmospheric oxygen causes natural bleaching.

Plain flour

Flour that does not have a leavening agent is called plain or all-purpose flour. It is appropriate for most bread and pizza bases. Some cookies are also prepared using this type of flour. Bread flour is high in gluten protein, with 12.5-14% protein compared to 10-12% protein in all-purpose flour. The increased protein binds to the flour to entrap carbon dioxide released by the yeast fermentation process, resulting in a stronger rise.

Self-rising flour

Leavening agents are used with some flours, especially those with significant gluten content, to produce lighter and softer baked products by embedding small gas bubbles. Self-rising (or self-raising) flour is sold premixed with chemical leavening agents. The added ingredients are evenly distributed throughout the flour which aids a consistent rise in baked goods. This flour is generally used for preparing scones, biscuits, muffins, etc. It was invented by Henry Jones and

patented in 1845. Plain flour can be used to make a type of self-rising flour although the flour will be coarser. Self-rising flour is typically composed of the following ratio:

- 1 cup (125 g) flour
- 1 teaspoon (3 g) baking powder
- a pinch to ½ teaspoon (1 g or less) salt

Enriched flour

During the process of making flour nutrients are lost. Some of these nutrients are replaced during refining and the result is "enriched flour".

Common preservatives sometimes added to commercial flour

Calcium propanoate

Sodium benzoate

Tricalcium phosphate

Butylated hydroxyanisole

Chapter 6

Types Of Flour

Wheat flour

More wheat flour is produced than any other flour. Wheat varieties are called "clean," "white," or "brown" or "strong" or "hard" if they have high gluten content, and they are called "soft" or "weak" flour if gluten content is low.

Other flours

Acorn flour is made from ground acorns and can be used as a substitute for wheat flour. It was used by Native Americans. Koreans also use acorn flour to make Dotorimuk

Almond flour is made from ground almonds, suitable for people with gluten-free diets or Coeliac disease.

Amaranth flour is a flour produced from ground amaranth grain. It was commonly used in pre-Columbian meso-American cuisine and was originally cultivated by the Aztecs. It is becoming more and more available in specialty food shops.

Atta flour is a whole-grain wheat flour important in Indian and Pakistani cuisine, used for a range of breads such as roti and chapatti.

Bean flour is flour produced from pulverized dried or ripe beans. Garbanzo and Fava bean flour is a gluten-free flour mixture with a high nutritional value and strong aftertaste

Brown rice flour is of great importance in Southeast Asian cuisine. Also edible rice paper can be made from it.

Buckwheat flour is used as an ingredient in many pancakes in the United States. In Japan, it is used to make a popular noodle called soba. In Russia, buckwheat flour is added to the batter for pancakes called blinis which are frequently eaten with caviar. Buckwheat flour is also used to make crêpes bretonnes in Brittany. On Hindu fasting days (Navaratri mainly, also Maha Shivaratri), people eat items made of buckwheat flour. The preparation varies across India. The

famous ones are Kuttu Ki Puri and Kuttu Pakoras. In most of northern and western states they call this Kuttu ka atta.

Cassava flour is made from the root of the cassava plant. In a purified form (pure starch), it is called tapioca flour

Chestnut flour is popular in Corsica, the Périgord and Lunigiana for breads, cakes and pastas. It is the original ingredient for "polenta", still used as such in Corsica and other Mediterranean locations. Chestnut bread keeps fresh for as long as two weeks. In other parts of Italy it is mainly used for desserts.

Chickpea flour (also known as gram flour or besan) is of great importance in Indian cuisine, and in Italy, where it is used for the Ligurian farinata.

Chuño flour made from dried potatoes in various countries of South America

Coconut flour is made from ground coconut meat and has the highest fiber content of any flour, having a very low concentration of digestible carbohydrates makes an excellent choice for those looking to restrict their carbohydrate intake.

Corn (maize) flour is popular in the Southern and Southwestern US, Mexico, Central America, and Punjab regions of India and Pakistan, where it called as Makkai Ka Atta. Coarse whole-grain corn flour is usually called corn meal. Finely ground corn flour that has been treated with food-grade lime is called masa harina (see masa) and is used to make tortillas and tamales in Mexican cooking. Corn flour should never be confused with cornstarch, which is known as "cornflour" in British English.

Cornmeal is very similar to corn flour except in a coarser grind.

Cornstarch is powdered endosperm of the corn kernel.

Glutinous rice flour or sticky rice flour, used in east and southeast Asian cuisines for making tangyuan, etc.

Hemp flour is produced by pressing the oil from the hemp seed, and milling the residue. Hemp seed is approximately 30% oil and 70% residue. Hemp flour doesn't rise, and is best mixed with other flours. Added to any flour by about 15-20%, it gives a spongy nutty texture and flavor with a green hue.

Maida flour is finely milled wheat flour used to make a wide variety of Indian breads such as paratha and naan. Maida is widely used not only in Indian cuisine but also in Central Asian and Southeast Asian cuisine. Though sometimes referred to as "all-purpose flour" by Indian chefs, it more closely resembles cake flour or even pure starch. In India, maida flour is used to make pastries and other bakery items such as bread, biscuits and toast.

Mesquite flour is made from the dried and ground pods of the Mesquite tree which grows throughout North America in arid climates. The flour has a sweet, slightly nutty flavor and can be used in a wide variety of applications.

Noodle flour is a special blend of flour used for the making of Asian style noodles. The flour could be from wheat or rice.

Nut flours are grated from oily nuts — most commonly almonds and hazelnuts — and are used instead of or in addition to wheat flour to produce more dry and flavorful pastries and cakes. Cakes made with nut flours are usually called tortes and most originated in Central Europe, in countries such as Hungary and Austria.

Peasemeal or pea flour is flour produced from roasted and pulverized yellow field peas.

Peanut flour made from shelled/cooked peanuts is higher protein alternative to regular flour.

Potato starch flour is obtained by grinding the tubers to a pulp and removing the fibre and protein by water-washings. Potato starch (flour) is very white starch powder used as a thickening agent. Standard (native) potato starch needs boiling, to thicken in water, giving a transparent gel. Because the flour is made from neither grain nor legume, it is used as substitute for wheat flour in cooking by Jews during Passover, when grains are not eaten.

Potato flour, often confused with potato starch, is a peeled, cooked potato, mashed, mostly drum dried and grinded potato flakes using the whole potato and thus containing the protein and some of the fibres of the potato; having an off-white slight yellowish color. Dehydrated potatoes or instant mashed potatoes can also be granular, flakes. Potato flour is cold-water soluble; however, it isn't used often as it tends to be heavy.

Rice flour is ground kernels of rice. It is used in Western countries and especially for people who suffer from gluten intolerance, since rice does not contain gluten. Brown rice flour has higher nutritional value than white rice flour

Rye flour is used to bake the traditional sourdough breads of Germany, Austria, Switzerland, Russia, Czech Republic, Poland and Scandinavia. Most rye breads use a mix of rye and wheat flours because rye does not produce sufficient gluten. Pumpernickel bread is usually made exclusively of rye, and contains a mixture of rye flour and rye meal.

Sorghum flour is made from grinding whole grains of the sorghum plant. It is called jowar in India.

Spelt, an ancient grain, is a cousin to wheat. But the protein makeup is somewhat different and therefore, spelt flour is often tolerated by people who have mild allergies to certain proteins that develop when gluten is formed in making dough. Spelt dough needs less kneading than wheat dough. Compared to hard-wheat flours, spelt flour has a relatively low (6 to 9%) protein count, just a little higher than pastry flour. That means that plain spelt flour works well in creating dough for soft foods such as cookies or pancakes. Crackers, turn out well because they are made from dough that does not need to rise when baked.

Tapioca flour, produced from the root of the cassava plant, is used to make breads, pancakes, tapioca pudding, a savoury porridge called fufu in Africa, and is used as a starch.

Teff flour is made from the grain teff, and is of considerable importance in eastern Africa (particularly around the horn of Africa). Notably, it is the chief ingredient in the bread injera, an important component of Ethiopian cuisine.

More types of flour

Flour can also be made from soybeans, peanuts, arrowroot, taro, cattails, acorns, manioc, quinoa and other non-cereal foodstuffs.

Flour type numbers

In some markets, the different available flour varieties are labeled according to the ash mass ("mineral content") that remains after a sample is incinerated in a laboratory oven (typically at 550 °C or 900 °C, see international standards ISO 2171 and ICC 104/1). This is an easily verified indicator for the fraction of the whole grain remains in the flour, because the mineral content of the starchy endosperm is much lower than that of the outer parts of the grain. Flour made from all parts of the grain (extraction rate: 100%) leaves about 2 g ash or more per 100 g dry flour. Plain white flour (extraction rate: 50–60%) leaves only about 0.4 g.

German flour type numbers (Mehltypen) indicate the amount of ash (measured in milligrams) obtained from 100 g of the dry mass of this flour. Standard wheat flours (defined in DIN 10355) range from type 405 for normal white wheat flour for baking, to strong bread flour types 550, 812, and the darker types 1050 and 1600 for wholegrain breads.

French flour type numbers (type de farine) are a factor 10 smaller than those used in Germany, because they indicate the ash content (in milligrams) per 10 g flour. Type 55 is the standard, hard-wheat white flour for baking, including puff pastries ("pâte feuilletée"). Type 45 is often called pastry flour, and is generally from a softer wheat (this corresponds to what older French texts call "farine de gruau"). Some recipes use Type 45 for croissants, for instance, although many French bakers use Type 55 or a combination of Types 45 and 55. Types 65, 80, and 110 are strong bread flours of increasing darkness, and type 150 is a wholemeal flour.

Czech flour types describes roughness of milling instead of amount of ash, though sometimes a numbering system is used, it is not a rule. Czechs determine following four basic types of mill: Extra soft wheat flour (Výběrová hladká mouka / 00), Soft wheat flour (Hladká mouka / T650), Fine wheat flour (Polohrubá mouka), Rough wheat flour (Hrubá mouka) and Farina wheat flour (Pšeničná krupice)

In the United States and the United Kingdom, no numbered standardized flour types are defined, and the ash mass is only rarely given on the label by flour manufacturers. However, the legally required standard nutrition label specifies the protein content of the flour, which is also a way for comparing the extraction rates of different available flour types.

In general, as the extraction rate of the flour increases, so do both the protein and the ash content. However, as the extraction rate approaches 100% (whole meal), the protein content drops slightly, while the ash content continues to rise. The following table shows some typical examples of how protein and ash content relate to each other in wheat flour:

Ash	Protein	Wheat flour type					
		US	German	French	Italian	Czech	Argentinian
~0.4%	~9%	pastry flour	405	40	00	Hladká mouka výběrová 00	0000
~0.55%	~11%	all-purpose flour	550	55	0	Hladká mouka	000
~0.8%	~14%	high gluten flour	812	80	1	Polohrubá mouka	00

~1%	~15%	first clear flour	1050	110	2	Hrubá mouka	0
>1.5%	~13%	white whole wheat	1600	150	Farina integrale di grano tenero	Pšeničná Krupice	½ 0

This table is only a rough guideline for converting bread recipes. Since flour types are not standardized in many countries, the numbers may differ between manufacturers. Note that there is no Type 40 French flour. The closest is Type 45.

It is possible to determine ash content from some US manufacturers. However, US measurements are based on wheat with a 14% moisture content. Thus, a US flour with 0.48% ash would approximate a French Type 55. For US bakers of French pastry seeking an equivalent, for example, they could look at tables published by King Arthur Flour, showing their all-purpose flour is a close equivalent to French Type 55.

Other measurable properties of flour as used in baking can be determined using a variety of specialized instruments, such as the Farinograph.

Flammability

Flour dust suspended in air is explosive—as is any mixture of a finely powdered flammable substance with air (see flour bomb). Some devastating and fatal explosions have occurred at flour mills, including an explosion in 1878 at the Washburn "A" Mill in Minneapolis, the largest flour mill in the United States at the time.

Products

Bread, pasta, crackers, many cakes, and many other foods are made using flour. Wheat flour is also used to make a roux as a base for thickening gravy and sauces. It is also the base for papier-mâché. Cornstarch is a principal ingredient used to thicken many puddings or desserts, and is the main ingredient in packaged custard.

Chapter 7

Kneading

Kneading is a process in the making of bread or pasta dough, used to mix the ingredients and add strength to the final product. Its importance lies in the mixing of flour with water. When these two ingredients are combined and kneaded, the gliadin and glutenin proteins in the flour expand and form strands of gluten, which gives bread its texture. (To aid gluten production, many recipes use bread flour, which is higher in protein than all-purpose flour.) The kneading process warms and stretches these gluten strands, eventually creating a springy and elastic dough. If bread dough is not kneaded enough, it will not be able to hold the tiny pockets of gas (CO₂) created by the leavening agent (such as yeast or baking powder), and will collapse, leaving a heavy and dense loaf.

Kneading can be performed by hand (the traditional way), with a mixer equipped with a dough hook, or with a bread machine. The dough is put on a floured surface, pressed and stretched with the heel of the hand, folded over, and rotated through 90° repeatedly. This process continues until the dough is elastic and smooth. The dough can then be allowed to rise or "prove".

Similar to kneading is **knocking back** or **punching down**, which is done to the dough after proving. The dough is punched once or twice, after which it is kneaded gently for a short time. The aim of this is to remove any large air pockets which have formed in the dough, create an even texture in the bread and redistribute the nutrients for the yeast, thus allowing fermentation to continue. The dough can then be proved a second time. Another method of knocking back (also known as "folding") is to gently stretch and pat out the proved dough before folding the sides in towards the centre.

In bread baking, kneading can be substituted by allowing a relatively wet, low-yeast dough to rise for more than twelve hours; this method is referred to as no-knead bread.

Dough scraper

A **dough scraper** is a tool used by bakers to manipulate dough and to clean surfaces on which dough has been worked. It is generally a small sheet of stainless steel (approximately 3"×5" or 8

cm × 13 cm) with a handle of wood, plastic, or simply a roll in the steel blade along one of the long sides.

Bakers and pastry chefs use this tool to help pick up, turn, and portion dough. When finished, the dough scraper can be used to scrape up the little bits of dough that have dried onto the kneading surface during the forming process. It can also be used in a more generic kitchen role to transfer sliced or diced foods from cutting board to pan.

This tool is known by a variety of names, including dough scraper, dough cutter, dough knife, pastry cutter, bench scraper, board scraper, and bench knife.

Some modern varieties of this tool have handles of nylon or silicone and even feature both straight and curved edges. These are intended primarily for the use of scraping cutting boards and bowls rather than working dough. These uses have introduced further variants of the name, including terms such as bowl scraper or chopper, scooper, scraper.

A **rolling pin** is a cylindrical food preparation utensil used to shape and flatten dough. Two styles of rolling pins are found; roller and rods. Roller types consists of a thick cylindrical roller with small handles at each end; rod type rolling pins are usually thin tapered batons. Rolling pins of different styles and materials offer advantages over another, as they are used for different tasks in cooking and baking.

Types of rolling pins

- **Rod:** Thin rods typically made of wood around 2–3 cm in diameter. They are used by rolling the rod across the dough using one's palm. The pins may be tapered at one or both ends for more pivot control in certain tasks such as making small jiaozi skins or pieshells. Most East Asian or French style rolling pins, and the Turkish Oklava are rod style.
- **Roller:** Consists of a thick heavy roller made of a variety of materials around 7–10 cm in diameter with thinner handles which extend through the roller. They are used by grasping the handles and pushing the pin across the dough. Many Western rolling pins are roller types.
- **Textured:** Some specialized rolling pins have textured surfaces that mark and indents the dough surfaces for special breads and pancakes.

A wooden belan rolling pin is used on a round chakla to make chapatis

In South Asia, the rolling pin (belan) is used in combination with a chakla (flat circular rolling board). The dough for chapatis is rolled on the chakla with the help of the belan. A modern electronic device, a small kitchen appliance called a Roti Maker (or Tortilla maker) combines the function of chakla, belan and round electric tava cooking griddle.

Material

Rolling pins come in a variety of sizes, shapes and materials including glass, ceramic, acrylic, bakelite, copper, brass, aluminium, silicone, wood, stainless steel, marble, and plastic.^[2] Some are hollow and are able to be filled with cold or warm water to better roll a desired food. Marble rolling pins are often cooled in a refrigerator for maintaining a cold dough while making puff pastry.

In popular culture

Rolling pins have been depicted as a stereotypical weapon of angry housewives and are sometimes employed in cartoons as an instrument for inflicting cranial injury, such as in the English strip Andy Capp. According to cookbook humorist author Peg Bracken, heavy wooden roller type rolling pins are best used on kitchen helpers when frustrated, and not on dough. However, being made of dense and hard wood serious injury could occur, and these uses of rolling pins are not recommended.

Roller docker

A **roller docker**, **rolling docker**, **dough docker**, **roto-fork**, or simply **docker** is a food preparation utensil which resembles either a small, spiked rolling pin, or a small rotary tiller. It is used to pierce bread dough, cracker dough, pizza dough or pastry dough to prevent over rising or blistering. This specialized tool is more commonly found in professional bakeries than in homes that only do light or occasional baking.

Roller dockers come in a variety of materials, including nylon, plastic, and steel.

Loaf

Round loaves of fresh bread are taken out of the oven with a peel

A **loaf** is a shape, usually rounded or oblong, mass of food. It may refer to a whole article of bread, or meatloaf

Bread pan

A **bread pan** is a kitchen utensil in the form of a container in which bread is baked. Its function is to shape bread while it is rising during baking. The most common shape of the bread pan is the loaf, or narrow rectangle, a convenient form which enables uniform slicing. The bread pan is made from a conductive material such as metal which might be treated with a non-stick coating. It can also be made of a special type of paper that sticks to the dough but is easily removed, once cooked. Bread pans are found in a variety of designs and sizes providing the baker with different possibilities not only for baking bread, but also cakes and puddings.

Cottage loaf

Cottage loaves are a traditional type of bread originating in England.

A cottage loaf is characterised by its shape, which is essentially that of two round loaves, one on top of the other, with the upper one being rather smaller: the shape is similar to that of the French brioche and the pain chapeau of Finistère.

The origins of the name and shape are unknown but possibly extend back hundreds of years. Elizabeth David, who described the cottage loaf in her *English Bread and Yeast Cookery*, surmised that the shape may have arisen as a way of saving 'floor space' in old-fashioned bread ovens.^[1] The name, however, did not first appear in writing until the mid 19th century. It was formerly possible to find an oblong version, known as a "cottage brick", and common in the London area. Cottage loaves, while formerly common, are now rarely found in bakeries, as they are relatively time-consuming and difficult to make, and along with all round loaves are less convenient for slicing.

Malt loaf

Malt loaf is a common snack food in the United Kingdom. Malt loaf has a sweet taste and a very chewy texture like very heavy, soft bread. It is made from malt and often contains fruit such as raisins. Malt loaf is usually eaten sliced and with butter.

History

In 1889, John Montgomerie of Scotland filed a U.S. patent application titled *Making Malted Bread* which was granted in 1890. This patent asserted a prior patent existed in England dated

1886. Montgerie claimed a novel saccharification process which involved warming a portion of dough mixed with diastatic malt extract to an appropriate mash temperature and holding it for a time so the extract's enzymes would pre-digest some of the starch.

Manufactured malt loaves

Soreen (/ˈsɔːriːn/ **SOR**-een) is a popular brand of malt loaf. The name is derived from 'Sorensen', the name of the family that once ran the company. Rikki Sorensen developed the loaf in conjunction with a business partner Green, hence the name, Soreen. Rikki was also responsible for developing the technique for drying egg white used in many cooking recipes. In 2003 Warburtons sold the brand to Inter Link Foods and in 2007 Soreen became part of McCambridge Group.^[2] Aunt Ellen's is another popular brand. Both are produced in Manchester.

Harvo was another brand of malt loaf which was made in Birmingham until the company went bankrupt in 1973. In some areas the name Harvo or Harvo Loaf is still often used to describe malt loaf regardless of the brand.

Variants in other countries

In December and during the holiday season, a similar type of bread called vörtbröd (literally “wort bread”) is very popular in Sweden. The dough's water is replaced by beer wort, adding sweetness and flavor to the bread. Several different spices and fruits commonly associated with Christmas are also added, e.g., cloves, cinnamon, ginger, cardamom and raisins. It is often the bread of choice in the sop called dopp i grytan (“dip in the pot”) popularly eaten on Christmas Eve.

Nutra loaf

Nutraloaf, sometimes called **prison loaf**, **disciplinary loaf**, **food loaf**, **confinement loaf**, **seg loaf**, or **special management meal**, is a food served in United States prisons to inmates who have demonstrated significant behavioral issues. It is similar to meatloaf in texture, but has a wider variety of ingredients. Prisoners may be served nutraloaf if they have assaulted prison guards or fellow prisoners. Prison loaf is usually bland, perhaps even unpleasant, but prison wardens argue that nutraloaf provides enough nutrition to keep prisoners healthy without requiring utensils to be issued.^[3]

Sugarloaf

A sugarloaf which required sugar nipsto break off pieces

A **sugarloaf** was the traditional form in which refined sugar was produced and sold until the late 19th century when granulated and cube sugars were introduced. A tall cone with a rounded top was the end-product of a process that saw the dark molasses-rich raw sugar, which had been imported from sugar cane growing regions such as the Caribbean and Brazil, refined into white sugar.

History

It is not known when sugarloaves were first made. The earliest record to date appears to be 12th century in Jordan.,^[2] though reference to a cone of sugar is found in al-Zubayr ibn Bakkar's 9th century Arabic *Al-Akhbar al-Muwaffaqiyyat*. In Europe, they were made in Italy from 1470, Belgium 1508, England 1544, Holland 1566, Germany 1573 and France 1613. When refining from sugar beet began in mainland Europe in 1799, loaves were produced in the same way and are still common in some parts, especially in Germany, where small loaves are a required ingredient for the Christmas season drink *Feuerzangenbowle*.

Until the mid-19th century, the British government used a system of punitive taxes to make it impossible for its colonial producers in the Caribbean to refine their own sugar and supply Britain with finished sugarloaves. Previously the Amsterdam industry had been similarly protected from the importation of East India white sugar. Instead, a dark raw sugar *ormuscovado*, produced on the plantations by initial boilings of the fresh cane juice, was shipped in hogsheads to Europe on what was the third leg of the infamous Triangular Trade.

The raw sugar was refined by a series of boiling and filtering processes. When, at the final boiling, it was considered ready for granulation it was poured into a large number of inverted conical molds. These were usually made of either brown earthenware or sheet iron with an internal treatment of slip or paint respectively, and each stood in its own collecting pot. Over the next few days most of the dark syrup and noncrystalline matter drained through a small hole in the bottom of the mould into the collecting pot. To improve the whiteness of the sugar repeated applications of either a solution of white clay or of loaf sugar dissolved in warm water was applied to the broad end of the loaf. This slowly drained through the loaf readily uniting with any

remaining molasses or other coloring matter and removing it to the collecting pot. The loaves were then tapped out of the molds, dried in a stove room that would have contained hundreds of loaves, trimmed to their final shape and wrapped, usually, in blue paper to enhance their whiteness.

The molds, and so the sugarloaves, varied in size considerably ... the larger the loaf the lower the grade of sugar. The grade determined the price, though loaves were sold by weight and the sugar refiner was taxed on the weight of sugar sold. When a new batch of raw sugar was refined the best sugar came from the first boiling. After that, the waste and trimmings from the first boiling were returned to the beginning of the process and mixed with further raw sugar for the second boiling, and, as this was repeated to the end of the batch, subsequent boilings reduced slightly in quality. The finest of the loaves, maybe 5 inches (13 cm) dia and 5 inches (13 cm) high, were extremely expensive owing to the prolonged repeating of the whitening process, as were the somewhat larger double refined loaves from the first few boilings. Lower grades of sugar were more difficult to crystallize and so larger molds were used, usually 10–14 inches (25–36 cm) in diameter and up to about 30 inches (76 cm) high, with loaves weighing up to 35 pounds (16 kg). The lowest standard refined grades were called bastards, though an even lower grade was often produced from the filtration scums, usually by a scum-boiler at his own separate premises.

(H)ouseholds bought their white sugar in tall, conical loaves, from which pieces were broken off with special iron sugar-cutters (sugar nips). Shaped something like very large heavy pliers with sharp blades attached to the cutting sides, these cutters had to be strong and tough, because the loaves were large, about 14 inches (36 cm) in diameter at the base, and 3 feet (0.91 m) 15th century...In those days, sugar was used with great care, and one loaf lasted a long time. The weight would probably have been about 30 pounds (14 kg). Later, the weight of a loaf varied from 5 to 35 pounds (2.3 to 16 kg), according to the moulds used by any one refinery. A common size was 14 pounds (6.4 kg), but the finest sugar from Madeira came in small loaves of only 3 to 4 pounds (1.4 to 1.8 kg) in weight...Up till late Victorian times household sugar remained very little changed and sugar loaves were still common and continued so until well into the twentieth century.

Sandwich loaf

Cut sandwich loaf

A **sandwich loaf** is a stacked party entrée that looks like a cake. While rare today, the food was quite popular during the mid 20th century in the United States. To create a sandwich loaf, bread is cut horizontally and spread with layers of filling. Common fillings include egg salad, chicken salad, ham salad, tuna salad, and Cheez Whiz, but other fillings are possible, including peanut butter and jelly and mock egg salad made from tofu. In a simple sandwich loaf the fillings may all be the same, but in more complex creations each layer is different.

White bread is usually used to create a sandwich loaf, but whole wheat is also acceptable. Sometimes white and whole wheat are used in alternating layers to create a ribbon effect. After the layers are assembled the entire loaf is coated with whipped cream cheese, which may be tinted with food coloring. Common garnishes are olives, parsley, grapes, and carrot curls. The loaf is sliced like a cake and eaten with a fork.

Chapter 8

Proofing (Baking Technique)

Peel (tool)

A peel is a shovel-like tool used by bakers to slide loaves of bread, pizzas, pastries, and other baked goods into and out of an oven. It is usually made of wood, with a flat carrying surface (like a shovel's blade) for holding the baked good and a handle extending from one side of that surface. Alternatively, the carrying surface may be made of sheet metal, which is attached to a wooden handle. Wood however, has the advantage if it is frequently in the oven, that it does not become hot enough to burn hands like metal can. The word presumably derives from the French *pelle*, which describes both a peel and a shovel.

A peel's intended functions are to:

- Transfer delicate breads, pastries, et cetera into an oven where transferring them directly by hand could deform their delicate structure.
- Allow food to be placed further back in an oven than could normally be reached by the baker.
- Keep the baker's hands out of the hottest part of an oven, or prevent the baker from burning their hands on the hot baked goods.

Prior to use, peels are often sprinkled with flour, cornmeal, or milled wheat bran, to allow baked goods to easily slide onto and off them.

There are peels of many sizes, with the length of the handle suited to the depth of the oven, and the size of the carrying surface suited to the size of the food it is meant to carry (for instance, slightly larger than the diameter of a pizza). Household peels commonly have handles around 15 cm long and carrying surfaces around 35 cm square, though handles range in length from vestigial (~6 centimeters) to extensive (~1.5 meters or more), and carrying surfaces range in size from miniature (~12 centimeters square) to considerably wide (1 meter square or more).

Other tools

An alternative, and related, meaning of the word "peel" is a wooden pole with a smooth cross-piece at one end, which was used in printing houses of the hand-press period (before around 1850) to raise printed sheets onto a line to dry, and to take them down again once dried. The term is also sometimes used for the blade of an oar. All three meanings derive ultimately from the Latin *pala*, a spade.

Proofing (baking technique)

Challah proofing in loaf pans. Bread covered with linen proofing cloth in the background.

Proofing (also called **proving**), as the term is used by professional bakers, is the final dough-rise step before baking, and refers to a specific rest period within the more generalized process known as fermentation. Fermentation is a step in creating yeast breads and baked goods where the yeast is allowed to leaven the dough.

Fermentation rest periods are not often explicitly named, and normally appear in recipes as "Allow dough to rise."

Proofing, as used in some cookbooks intended for home use, may refer to testing the viability of yeast. Dry yeast is mixed with a small amount of warm water and sugar, and if the yeast is viable, a layer of foam is developed by the action of the yeast. Typically, using US customary volume units, $\frac{1}{4}$ cup (≈ 59.1 mL) water at 105–115 °F (41–46 °C) and $\frac{1}{2}$ teaspoon (≈ 2.5 mL) of sugar are used, or expressed differently, a sugar weight of about 3.5% of the water's weight. While this sugar may be sucrose or table sugar, instead it may be glucose or maltose,[2] typically enzyme-derived from starch.

Proofing yeast may refer to the process of first dissolving yeast in warm water. Some believe this is a needed hydration step when using active dry yeast. Other bakers put active dry yeast directly into the bread dough undissolved. To hydrate the yeast, the weight of water required may be calculated: yeast weight $\times 4 =$ water weight. In one variant of the sponge technique known as poolish, proofing the yeast is the process step prior to feeding the yeast any carbohydrate.

Dough processes

The process of making yeast-leavened bread involves a series of alternating work and rest periods. Work periods occur when the dough is manipulated by the baker. Some work periods are called mixing, kneading, and folding, as well as division, shaping, and panning. Work periods are typically followed by rest periods, these occur when dough is allowed to sit undisturbed. Particular rest periods include, but are not limited to, autolyse, bulk fermentation and proofing. Proofing, also sometimes called final fermentation, is the specific term for allowing dough to rise after it has been shaped and before it is baked.

Autolyse is an essential dough process. It refers to a period of rest after the initial mixing of flour and water, a rest period that occurs sequentially before the addition of yeast and other ingredients. This rest period allows for better absorption of water and helps the gluten and starches to align. Breads made with autolysed dough are easier to shape and have more volume and improved structure.

Fermentation typically begins when viable yeast or a starter culture is added to flour and water. During fermentation, yeast converts glucose and other carbohydrates to carbon dioxide gas which makes the dough rise, and alcohol which gives the baked bread flavor.

Depending on a bread's recipe, different bread varieties will have different process requirements. These are generally classified as either straight or sponge dough processes. Some straight doughs will require only a single mixing period while others, particularly sponge doughs, will need multiple periods. Between rest stages of fermentation recipes will often instruct a cook to "punch down" or "deflate" the dough to expel gas from the carbon dioxide bubbles that have formed.

Overproofing occurs when a fermenting dough has rested too long. Its bubbles have grown so large that they have popped and tunneled, and dough baked at this point would result in a bread with poor structure. Length of rest periods, including proofing, can be determined by time at specific temperatures or by characteristics. Often the "poke method" is used to determine if a dough has risen long enough. If the dough, when poked, springs back immediately it is under proofed and needs more time.

Retarding may occur at any time during fermentation and is accomplished by placing the dough into a dough retarder, refrigerator, or other cold environment to slow the activity of the yeast.

The retarding stage is often used in sourdough bread recipes to allow the bread to develop its characteristic flavor. A cold fermentation stage is sometimes used to develop flavor in other artisan breads, with a part of the dough ("pre-ferment") before the final mixing, with the entire dough during bulk fermentation, or in the final fermentation stages after shaping.

Proofing equipment

To ensure consistent results, specialized tools are used to manipulate the speed and qualities of fermentation.

A **dough proofer** is a chamber used in baking that encourages fermentation of dough by yeast through warm temperatures and controlled humidity. The warm temperatures increase the activity of the yeast, resulting in increased carbon dioxide production and a higher, faster rise. Dough is typically allowed to rise in the proofer before baking.

A **dough retarder** is a refrigerator used to control the fermentation of yeast when proofing dough. Lowering the temperature of the dough produces a slower, longer rise with more varied fermentation products, resulting in more complex flavors. In sourdough bread-making, cold decreases the activity of wild yeast relative to the Lactobacilli, which produce flavoring products such as lactic acid and acetic acid. Dough that is retarded before baking results in a sourer loaf. To prevent the dough from drying, air flow in the dough retarder is kept to a minimum. Home bakers may use cloth to cover dough that is kept for a longer period in the refrigerator.

A **banneton** is a type of basket used to provide structure for the sourdough breads during proofing. Proofing baskets are distinct from loaf pans in that the bread is normally removed from these baskets before baking. Conventionally, these baskets are made out of wicker, but many modern proofing baskets are made out of silicone or plastic. A banneton will often have a cloth liner to prevent dough from sticking to the sides of the basket, though some have no such cloth. These baskets are used both to provide the loaf with shape and to wick moisture from the crust. Banneton baskets are also known as Brotform or proofing baskets. Alternatively, a couche (pronounced koosh) or proofing cloth can be used on which to proof dough, or it can be used to cover the dough. Couches are generally made of linen or other coarse material to which the dough will not stick and are left unwashed, so as to let yeast and flour collect in them, aiding the proofing process. A banneton is used for round loaves, called boules, and a couche is typically used for longer loaves, such as baguettes.

Sliced bread

Sliced bread is a loaf of bread that has been pre-sliced with a machine and packaged for convenience. It was first sold in 1928, advertised as "the greatest forward step in the baking industry since bread was wrapped". This led to the popular phrase, "the greatest thing since sliced bread".

History

Chillicothe Baking Company's building in Chillicothe, Missouri where bread was first machine sliced for sale

This photograph depicts a "new electrical bread slicing machine" in use by an unnamed bakery in St. Louis in 1930 and may well show Rohwedder's machine in use by the Papendick Bakery Compa

The multiple cutting bands in Rohwedder's 1928 slicer are shown in this diagram from his patent

Otto Frederick Rohwedder of Davenport, Iowa, USA invented the first loaf-at-a-time bread-slicing machine. A prototype he built in 1912 was destroyed in a fire and it was not until 1928 that Rohwedder had a fully working machine ready. The first commercial use of the machine was by the Chillicothe Baking Company of Chillicothe, Missouri, which produced their first slices on July 7, 1928. Their product, "Kleen Maid Sliced Bread", proved a success. Battle Creek, Michigan has a competing claim as the first city to sell bread presliced by Rohwedder's machine; however, historians have produced no documentation backing up Battle Creek's claim. The bread was advertised as "the greatest forward step in the baking industry since bread was wrapped."

St. Louis baker Gustav Papendick bought Rohwedder's second bread slicer and set out to improve it by devising a way to keep the slices together at least long enough to allow the loaves to be wrapped.[2] After failures trying rubber bands and metal pins, he settled on placing the slices into a cardboard tray. The tray aligned the slices, allowing mechanized wrapping machines to function. W.E. Long, who promoted the Holsum Bread brand, used by various independent

bakers around the country, pioneered and promoted the packaging of sliced bread beginning in 1928. In 1930 Wonder Bread, first sold in 1925, started marketing sliced bread nationwide.

Effects

As commercially sliced bread resulted in uniform and somewhat thinner slices, people ate more slices of bread at a time, and ate bread more frequently, because of the ease of eating another piece of bread. This increased consumption of bread and, in turn, increased consumption of spreads, such as jam, to put on the bread.

1943 U.S. ban on sliced bread

During 1943, U.S. officials imposed a short-lived ban on sliced bread as a wartime conservation measure. The ban was ordered by Claude R. Wickard who held the position of Food Administrator, and took effect on January 18, 1943. According to the New York Times, officials explained that "the ready-sliced loaf must have a heavier wrapping than an unsliced one if it is not to dry out." It was also intended to counteract a rise in the price of bread, caused by the Office of Price Administration's authorization of a ten percent increase in flour prices.

In a Sunday radio address on January 24, Mayor LaGuardia suggested that bakeries that had their own bread-slicing machines should be allowed to continue to use them, and on January 26, 1943, a letter appeared in the New York Times from a distraught housewife:

I should like to let you know how important sliced bread is to the morale and saneness of a household. My husband and four children are all in a rush during and after breakfast. Without ready-sliced bread I must do the slicing for toast—two pieces for each one—that's ten. For their lunches I must cut by hand at least twenty slices, for two sandwiches apiece. Afterward I make my own toast. Twenty-two slices of bread to be cut in a hurry!

On January 26, however, John F. Conaboy, the New York Area Supervisor of the Food Distribution Administration, warned bakeries, delicatessens, and other stores that were continuing to slice bread to stop, saying that "to protect the cooperating bakeries against the

unfair competition of those who continue to slice their own bread... we are prepared to take stern measures if necessary.

On March 8, 1943, the ban was rescinded. Wickard stated that "Our experience with the order, however, leads us to believe that the savings are not as much as we expected, and the War Production Board tells us that sufficient wax paper to wrap sliced bread for four months is in the hands of paper processor and the baking industry.

Around the world

Due to its convenience, sliced bread is popular in many parts of the world, and the usual thickness varies by company and country:

- In Canada it is usually 10mm thick.
- In Britain, sliced bread is sold as either "Extra Thick", "Thick", "Medium" or "Thin" varying across the 5-20mm range.
- In Ireland, the most popular bread type is known as "sliced pan", sold in 800- or 400-gram loaves, wrapped in wax paper, with the slices conveniently sized for making sandwiches and toast.
- In Japan, the same half-loaf of bread is labeled by the number of slices (usually 4, 5, or 6, and occasionally 8 or 10). Thin presliced crustless "sandwich bread" is also sold in Japan, since regular 4-6 slice bread is deemed too thick.
- In the United States, Texas toast is a type of packaged bread which is pre-sliced at double the typical thickness of most pre-sliced breads.

Chapter 9

Confectionery

Confectionery is related to the food items that are rich in sugar and often referred to as a confection. Confectionery refers to the art of creating sugar based dessert forms, or subtleties (subtlety or sotelty), often with pastillage. From the Old French confection, origin of Latin confectio(n-), from conficere, to "put together". The confectionery industry also includes specialized training schools and extensive historical records. Traditional confectionery goes back to ancient times, and continued to be eaten through the Middle Ages into the modern era. Confections include sweet foods, sweetmeats, digestive aids that are sweet, elaborate creations, and something amusing and frivolous.

Confectionery, delicacies or sweetmeats that have sugar as a principal ingredient, combined with coloring matter and flavoring and often with fruit or nuts. In the United States it is usually called candy, in Great Britain, sweets or boiled sweets. Non chocolate candy is roughly divided into two classes, hard and soft; the distinction is based on the fact that sugar when boiled passes through definite stages during the process of crystallization. Fondant, or sugar cooked to the soft stage, is the basis of most fancy candies, such as chocolate creams.

Sweetmeats, long known in the Middle East and Asia and to the ancient Egyptians, were at first preserved or candied fruits, probably made with honey. One of the earliest functions of candy was to disguise unpleasant medicine, and prior to the 14th cent. confections were sold chiefly by physicians. Medieval physicians often used for this purpose sugarplate, a sweetmeat made of gum dragon, white sugar, and rosewater, beaten into a paste. One of the earliest confections still surviving is marzipan, known throughout Europe; it is made of almonds or other nuts, pounded to a paste and blended with sugar and white of egg. In the Middle Ages it was sometimes molded into fancy shapes and stamped with epigrams.

Sugarplums, made of boiled sugar, were known in England in the 17th cent., but it was not until the 19th cent. that candy making became extensive. The display of British boiled sweets at the national exhibition of 1851 stimulated manufacture in other countries, especially in France. In the United States in the middle of the 19th cent. about 380 small factories were making lozenges,

jujube paste, and stick candy, but most fine candy was imported. With the development of modern machinery and the increasing abundance of sugar, confectionery making became an important industry. In 2001, estimated retail sales of chocolate, other candy, and gum in the United States had reached \$24 billion, and more 1,400 new items of candy were introduced.

A food product generally containing a large amount of sugar, having a high caloric content and pleasant taste and smell, and easily assimilated by the body. Ingredients include sugar, syrup, honey, fruits and berries, wheat flour (sometimes oat, soy, corn, or rye flour), milk and butter, fats, starch, cocoa, nuts, eggs, acids, and gelatinizing agents and flavorings which are processed by heat and various mechanical means. The high nutritive value of confectioneries is due to the considerable carbohydrate, fat, and protein content. Many confections are enriched with vitamins.

On the basis of ingredients, methods of production, and final product, confectioneries fall into two main groups: (1) sugar confectionery, including caramels, candies, chocolates, and cocoa, fruit-marmalade sweets, halvah and other Oriental sweets, toffee, and dragée and (2) flour confectionery, including cookies, crackers, galettes, shortbread, wafers, cakes, pastries, and keks (a kind of cake without icing).

Confectioneries preserve their quality for a long period, and for this reason are used as food on trips and hikes and by athletes. There are also dietetic and therapeutic confectioneries, which differ chemically from ordinary confections. In diabetic sweets, the sugar substances are replaced by sorbitol or xylitol. Sweets for anemic patients are enriched with hematogen, a source of iron and whole protein. For those suffering from goiter and as a food supplement for the elderly, confections are enriched with trace elements and *Laminaria saccharina*, a source of iodine and alginic acid. Coffee is excluded from confectionery for children, and the amount of cocoa is kept to a minimum.

Modern usage may include substances rich in artificial sweeteners as well. The words **candy** (US and Canada), **sweets** (UK and Ireland), and **lollies** (Australia and New Zealand) are also used for the extensive variety of confectionery.

Generally, confections are low in micronutrients but rich in calories. Specially formulated chocolate has been manufactured in the past for military use as a high density food energy source.

Sweetening agents

Confectioneries are defined by the presence of sweeteners. These are usually sugars, but it is possible to buy sugar-free sweets, such as sugar-free peppermints. Most common is the disaccharide sucrose. Hydrolysis of sucrose gives a mixture called invert sugar, which is sweeter and is also a common ingredient. Finally confectioneries, especially commercial ones, are sweetened by a variety of syrups obtained by hydrolysis of starch, these include corn syrup

Regional names

Different dialects of English use regional terms for confections:

- In Britain, Ireland and some Commonwealth countries, sweets or, more colloquially, sweeties (particularly used by children, the Scottish Gaelic word *suiteis* is a derivative). In some parts of England, *spice*, *joy joy* and *goodies* are terms used, alongside sweets, to denote confectionery. In North West England, especially Lancashire, *toffees* is often used as a generic term for all confectionery. Northeast England and the Scottish Borders commonly use the words *chuggy*,
- *chuddy* and *chowie*, as localised terms for chewing gum. In North East England, the word *kets* is commonly used for confectionery.
- In Australia and New Zealand, *lollies*.
- In North America, *candy*, although this term generally refers to a specific range of confectionery and does not include some items called confectionery (e.g. ice cream).

Chocolate is a common and popular confectionery and can be used in a wide variety of ways.

Confectionery items include sweets, lollipops, candy bars, chocolate, cotton candy, and other sweet items of snack food. The term does not generally apply to cakes, biscuits, or puddings which require cutlery to consume, although exceptions such as *petits fours* or *meringues* exist.

Some of the categories and types of confectionery include the following:^[5]

- Caramels: Derived from a mixture of sucrose, glucose syrup, and milk products. The mixture does not crystallize, thus remains tacky.
- Chocolates: Bite-sized confectioneries generally made with chocolate.
- Divinity: A nougat-like confectionery based on egg whites with chopped nuts.
- Dodol: A toffee-like food delicacy popular in Indonesia, Malaysia, and the Philippines
- Dragée: Sugar-coated almonds and other types of sugar panned candy.
- Fondant: Prepared from a warm mixture of glucose syrup and sucrose, which is partially crystallized. The fineness of the crystallites results in a creamy texture.
- Fudge: Made by boiling milk and sugar to the soft-ball stage. In the US, it tends to be chocolate-flavored.
- Halvah: Confectionery based on tahini, a paste made from ground sesame seeds.
- Hard sweets: Based on sugars cooked to the hard-crack stage. Examples include suckers (known as boiled sweets in British English), lollipops, jawbreakers (or gobstoppers), lemon drops, peppermint drops and disks, candy canes, rock candy, etc. Also included are types often mixed with nuts such as brittle. Others contain flavorings including coffee such as Kopiko.
- Ice cream: Frozen, flavoured cream, often containing small pieces of chocolate, fruits and/or nuts.
- Jelly candies: Including those based on sugar and starch, pectin, gum, or gelatin such as Turkish delight (lokum), jelly beans, gumdrops, jujubes, gummies, etc
- Liquorice: Containing extract of the liquorice root. Chewier and more resilient than gum/gelatin candies, but still designed for swallowing. For example, Liquorice allsorts. Has a similar taste to star anise.
- Marshmallow: "Peeps" (a trade name), circus peanuts, fluffy puff, etc.
- Marzipan: An almond-based confection, doughy in consistency, served in several different ways.
- Mithai: A generic term for confectionery in India, typically made from dairy products and/or some form of flour. Sugar or molasses are used as sweeteners.

- Tablet: A crumbly milk-based soft and hard candy, based on sugars cooked to the soft-ball stage. Comes in several forms, such as wafers and heart shapes. Not to be confused with tableting, a method of candy production.
- Taffy or chews: A candy that is folded many times above 50 °C, incorporating air bubbles thus reducing its density and making it opaque.

Risks

Excessive consumption of confectionery has been associated with increased incidences of type 2 diabetes, obesity, and tooth decay. Contaminants and coloring agents as well as toys and other non-nutritive products in confectionery can be particularly harmful to children. This non-nutritive material can cause injury or pose choking hazards. Therefore, confectionery contaminants such as high levels of lead have been restricted to 1 ppm in the US. There is no specific maximum in the EU.

Candy colorants, particularly yellow colorants such as E102 Tartrazine, E104 Quinoline Yellow and E110 Sunset Yellow FCF, do have many restrictions around the world. Tartrazine, for example, can cause allergic and asthmatic reactions and was once banned in Austria, Germany, and Norway. Some countries such as the UK have asked the food industry to phase out the use of these colorants, especially for products marketed to children.

Non-nutritive toy products such as chocolate eggs containing packaging with a toy inside are banned from sale in the US. If the material attached to confectionery does have a function and will not cause any injury to the consumer, it is allowed to be marketed. In the EU however, the Toy Safety Directive 2009/48/EC specifies that toys contained in food only need separate packaging that cannot be swallowed.

Confectionery store

A **confectionery store** (more commonly referred to as a **sweet shop** in the United Kingdom, a **candy store** in the North America, or a **lolly shop** in Australia) sells confectionery and is usually targeted to children. Most confectionery stores are filled with an assortment of sweets far larger than a grocer or convenience store could accommodate. They often offer a selection of old

fashioned treats, and sweets from different countries. Very often unchanged in layout since their inception, confectioneries are known for their warming and nostalgic feel.

The village of Pateley Bridge claims to have the oldest confectionery store in England.

Sweet bread

Sweetbreads or **ris** are culinary names for the thymus (also called throat, gullet, or neck sweetbread) or the pancreas (also called heart, stomach, or belly sweetbread) especially of the calf (ris de veau) and lamb (ris d'agneau) (although beef and pork sweetbreads are also eaten). Various other glands used as food may also be called "sweetbreads", including the parotid gland ("cheek" or "ear" sweetbread), the sublingual glands ("tongue" sweetbreads or "throat bread"), and testicles (cf. Rocky Mountain oyster or lamb fries). The "heart" sweetbreads are more spherical in shape, and surrounded symmetrically by the "throat" sweetbreads, which are more cylindrical in shape.

One common preparation of sweetbreads involves soaking in salt water, then poaching in milk, after which the outer membrane is removed. Once dried and chilled, they are often breaded and fried. They are also used for stuffing or in pâtés. They are grilled in many Latin American cuisines, such as in the Argentine asado, and served in bread in Turkish cuisine.

The word "sweetbread" is first attested in the 16th century, but the etymology of the name is unclear. "Sweet" is perhaps used since the thymus is sweet and rich-tasting, as opposed to savory-tasting muscle flesh. "Bread" may come from brede, "roasted meat" or from the Old English bræd ("flesh" or "meat").

Culinary name

Culinary names, **menu names**, or **kitchen names** are names of foods used in the preparation or selling of food, as opposed to their names in agriculture or in scientific nomenclature. The menu name may even be different from the kitchen name. For example, from the 19th until the mid-20th century, many restaurant menus were written in French and not in the local language.

Examples include veal (calf), calamari (squid), scampi (Italian-American name for shrimp), and sweetbreads (pancreas or thymus gland). Culinary names are especially common for fish and seafood, where multiple species are marketed under a single familiar name.

Foods may come to have distinct culinary names for a variety of reasons:

- Euphemism: the idea of eating some foods may disgust or offend some eaters regardless of their actual taste.
 - Testicles: Rocky Mountain oysters, Prairie oysters, lamb fries, or animelles
 - Fish Milt: Soft roe or white roe to disguise that is actually sperm not eggs
 - Sweetbreads: Thymus gland and pancreas gland
 - Kangaroo meat: "Australus" has been proposed as a euphemism
- Attractiveness: the traditional name may be considered dull, undistinctive, or unattractive.
 - Kiwifruit: A rename of the Chinese gooseberry, which references its fuzzy brown skin, and has now become its standard name
 - Mahi-Mahi: The dolphinfish is often referred to with this name to avoid confusion with dolphin (the mammal) meat.
 - The Patagonian toothfish is marketed as the Chilean sea bass
 - The spinal marrow of veal and beef is called amourettes.^{[1][2]}
- Grouping of a variety of sources under a single name
 - Tuna includes several different species
- Evocation of more prestigious, rarer, and more expensive foods for which they are a substitute
 - Lumpfish (or lumpfish) roe is named lumpfish caviar
 - Cassia bark is called cinnamon.
 - Langostino is sometimes called lobster or "langostino lobster."
 - In North America, many flounder species are called soles, e.g. *Microstomus pacificus* is named "Dover sole"
- Evocation of a specific culinary tradition
 - Shrimp in Italian-American contexts is often called scampi
 - Florentine refers to dishes that include spinach.

- Squid is often called by its Italian name, calamari on menus.^[3]
- Social differences
 - Beef, veal, pork, mutton, and venison were the words used by the French-speaking lords in post-Conquest England.^[citation needed]
- Other
 - In French, chestnuts are called châtaignes on the tree, but marrons in the kitchen.

Laver is a culinary name for certain edible algae.

Hard candy

Syrup (sucrose, glucose, or fructose) or isomalt, citric acid, food colouring
flavouring

Many (such as candy cane or lollipop)

Hard Candy or Boiled Sweet

A **hard candy**, or **boiled sweet**, is a candy prepared from one or more syrups boiled to a temperature of 160 °C (320 °F). After a syrup boiled to this temperature cools, it is called hard candy, since it becomes stiff and brittle as it approaches room temperature. Hard candy recipes variously call for syrups of sucrose, glucose, or fructose.

Once the syrup blend reaches the target temperature, the confectioner removes it from the heat source, and may add citric acid, food dye, and some flavouring, such as a plant extract, essential oil, or flavorant. One might then pour the syrup concoction (which is now very viscous) into a mold or tray to cool. When the syrup is cool enough to handle, one can fold, roll, and mold it into the shapes desired.

Hard candies and throat lozenges prepared without sugar employ isomalt as a sugar substitute, and are sweetened further by the addition of an artificial sweetener, such as aspartame, or a sugar alcohol, such as xylitol.

Among the many hard candy varieties are stick candy (such as the candy cane), the lollipop, the aniseed twist, and the bêtises de Cambrai.

Chapter 10

Sugar confectionery

Sugar confectionery refers to a large range of food items, commonly known as sweets. Boiled sweets, toffees, marshmallows, and fondant are all examples.

Sweets are a non-essential commodity, but are consumed by people from most income groups. The variety of products is enormous, ranging from cheap, individually-wrapped sweets, to those presented in boxes with sophisticated packaging.

Nutritional significance

The main ingredient used in the production of sweets is sugar (sucrose). There is a danger that if sweets are consumed in excess over a prolonged period of time they may contribute to obesity. Unless good dental care is practiced, over-consumption can also lead to tooth decay.

Principles of sugar confectionery production

By varying the ingredients used, the temperature of boiling, and the method of shaping, it is possible to make a wide variety of products. In all cases, however, the principle of production remains the same and is outlined below:

- balance the recipe
- prepare the ingredients
- mix together the ingredients
- boil the mixture until the desired temperature has been reached
- cool
- shape
- pack.

A range of sweets for sale

Many factors affect the production and storage of sweets:

- the degree of sucrose inversion (see below)
- the time and temperature of boiling
- the residual moisture content in the confectionery
- the addition of other ingredients.

Degree of inversion

Sweets containing high concentrations of sugar (sucrose) may crystallize either during manufacture or on storage (commonly referred to as graining). Although this may be desirable for certain products (such as fondant and fudge), in most other cases it is seen as a quality defect.

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. This natural process of inversion, however, makes it difficult to accurately assess the degree of invert sugar that will be produced.

As a way of controlling the amount of inversion, certain ingredients, such as cream of tartar or citric acid, may be used. Such ingredients accelerate the breakdown of sucrose into invert sugar, and thereby increase the overall percentage of invert sugar in the solution. A more accurate method of ensuring the correct balance of invert sugar is to add glucose syrup, as this will directly increase the proportion of invert sugar in the mixture.

The amount of invert sugar in the sweet must be controlled, as too much may make the sweet prone to take up water from the air and become sticky. Too little will be insufficient to prevent crystallization of the sucrose. About 10-15 per cent of invert sugar is the amount required to give a non-crystalline product.

Time and temperature of boiling

The temperature of boiling is very important, as it directly affects the final sugar concentration and moisture content of the sweet. For a fixed concentration of sugar, a mixture will boil at the

same temperature at the same altitude above sea-level, and therefore each type of sweet has a different heating temperature (see chart below).

Boiling point of sucrose solutions

Sucrose concentration (per cent)	Degrees C Boiling point *	Degrees F Boiling point *
40	101.4	214.5
50	102	215.5
60	103	217.5
70	105.5	222
75	108	227
80	111	232
85	116	241
90	122	252
95	130	266

*at sea level.

Variations in boiling temperature can make a difference between a sticky, cloudy sweet or a dry, clear sweet. An accurate way of measuring the temperature is to use a sugar thermometer. Other tests can be used to assess the temperature (for example, toffee temperatures can be estimated by removing a sample, cooling it in water, and examining it when cold). The temperatures are known by distinctive names such as 'soft ball', 'hard ball' etc., all of which refer to the consistency of the cold toffee.

Type of sweet Temperature range for boiling (Degrees C)

Fondants 116-121

Fudge 116

Caramels and regular toffee 118-132

Hard toffee (e.g. butterscotch) 146-154

Hard-boiled sweets 149-166

Moisture content

The water left in the sweet will influence its storage behaviour and determine whether the product will dry out, or pick up, moisture.

For sweets which contain more than 4 per cent moisture, it is likely that sucrose will crystallize on storage. The surface of the sweet will absorb water, the sucrose solution will subsequently weaken, and crystallization will occur at the surface - later spreading throughout the sweet.

Added ingredients

The addition of certain ingredients can affect the temperature of boiling. For example, if liquid milk is used in the production of toffees, the moisture content of the mixture immediately increases, and will therefore require a longer boiling time in order to reach the desired moisture content.

Added ingredients also have an effect on the shelf-life of the sweet. Toffees, caramels, and fudges, which contain milk-solids and fat, have a higher viscosity, which controls crystallization. On the other hand, the use of fats may make the sweet prone to rancidity, and consequently the shelf-life will be shortened.

Types of sweets

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

life than many other sugar confectionery products. Both fondants and creams are commonly used as soft centres for chocolates and other sweets.

Gelatin sweets

These sweets include gums, jellies, pastilles, and marshmallows. They are distinct from other sweets as they have a rather spongy texture which is set by gelatin.

Toffee and caramels

These are made from sugar solutions with the addition of ingredients such as milk-solids and fats. Toffees have a lower moisture content than caramels and consequently have a harder texture. As the product does not need to be clear, it is possible to use unrefined sugar such as jaggery or gur, instead of white granular sugar.

Hard-boiled sweets

These are made from a concentrated solution of sugar which has been heated and then cooled to form a solid mass containing less than 2 per cent moisture. Within this group of products there is a wide scope to create many different colours, flavours and shapes through the use of added flavourings and colourings.

Processing

Boiling

There are three main ways by which to boil the sugar solution:

- a simple open boiling pan
- a steam jacketed pan
- a vacuum cooker.

Steam jacketed pans are often fitted with scrapers and blades which make the mixing and heating process more uniform, and lessen the possibility of localized over-heating. Vacuum cookers are not generally used at a small scale.

Cooling

All sweets are cooled slightly before being shaped. Most simply, the boiled mass is poured onto a table (this should be made from metal, stone, or marble to cool the product uniformly). The table should be clean and free from cracks, as they may harbour dirt and microorganisms.

It is important that the boiled mass is cooled sufficiently, since if it is to be formed by hand there is a danger that the operator may suffer burns.

Equipment required

Processing stage	Equipment	Section reference
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Mix ingredients	Weighing and measuring equipment	64.1 and 64.2
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Boil

Heat source	36.0
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Boiling pans	48.0
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Steam jacketed pans	48.0
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Thermometer	63.0
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Cool	Table
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Beat	Hand whisk or liquid mixer
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Form/set	Starch mould cutting equipment	17.1
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Pack	Waxed papers cellulose films aluminium foils or polythene bags
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Heat sealer	47.1
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Wrapping equipment	47.3
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Beating

Beating is a process which controls the process of crystallization and produces crystals of a small size. For example in the production of fudge, the mass is poured onto the table, left to cool, and then beaten with a wood or metal beater.

Forming/setting

There are two main ways of forming sweets: cutting into pieces, or setting in moulds.

Moulds may be as simple as a greased and lined tray. Other moulds can be made from rubber, plastic, metal, starch, or wood. It is possible to make starch moulds by preparing a tray of cornstarch (cornflour), not packed too tightly. Impressions are then made in the starch using wooden shapes. The mixture is poured into the impressions and allowed to set.

Packaging

When sweets are stored without proper packaging, especially in areas of high humidity, the sucrose may crystallize, making the sweet sticky and grainy. Traditional packaging materials such as banana or sugar-cane leaves are often used to wrap sweets. However, these do not provide sufficient protection for a long shelf-life because they are not efficient barriers to moisture and cannot be securely sealed.

Alternatively, individual wraps can be made from waxed paper, aluminium foil, and cellulose film, or a combination of these. In most cases, the sweets will be wrapped by hand, but for higher production, semi-automatic wrapping machines are available. For further protection, the individually-wrapped sweets may be packed in a heat-sealed polythene bag.

Sweets can also be packaged in glass jars, or tins with close fitting lids.

Suitability for small-scale production

Certain types of sweets such as hard-boiled sweets require good quality ingredients (such as white granulated sugar). Such ingredients often need to be imported from other parts of the country, as they may not be widely or cheaply available in all areas.

It is possible to produce high-quality sweets on a small scale using inexpensive pieces of equipment. However, an open boiling pan gives less control over the boiling process and ultimately less control over the quality of the finished product. If simple equipment is used, the process will rely heavily upon the producer's experience and skills in production.

By using the basic principles of sweet making, the producer can use her/his creative skills to produce a wide range of products from local resources and materials.

Chapter 11

Liquorice (confectionery)

Liquorice is a confectionery flavoured with the extract of the roots of the liquorice plant. A wide variety of liquorice sweets are produced around the world. In North America, liquorice is called black liquoric to distinguish it from similar confectionery varieties that are not flavoured with liquorice extract, and commonly manufactured in the form of chewy ropes or tubes. In addition to these, various other liquorice-based sweets are sold in the United Kingdom, such as liquorice allsorts. Dutch and Nordic liquorice characteristically contains ammonium chloride instead of sodium chloride, prominently so in salty liquorice.

The essential ingredients of liquorice candy are liquorice extract, sugar, and a binder. The binder is typically starch/flour, gum arabic, or gelatin, or a combination thereof. Additional ingredients are extra flavouring, beeswax for a shiny surface, ammonium chloride, and molasses to give the end product the familiar black colour. Ammonium chloride is mainly used in salty liquorice candy, with concentrations up to about 8 percent. However, even regular liquorice candy can contain up to 2 percent ammonium chloride, the taste of which is less prominent due to the higher sugar concentration. Some liquorice candy is flavoured with anise oil instead of or in combination with liquorice root extract.

Production

During manufacturing, the ingredients are dissolved in water and heated to 135 °C (275 °F). In order to obtain sweets of the desired shapes, the liquid is poured into molds that are created by impressing holes into a container filled with starch powder. The liquid is then dried and the resulting sweets are sprayed with beeswax to make their surface shiny.

Liquorice

The liquorice-root extract contains the natural sweetener glycyrrhizin, which is over 50 times sweeter than sucrose. This ingredient has various pharmaceutical properties, the most important ones being that it acts as an expectorant (facilitating removal of mucus from the lungs by

coughing) and that it increases blood pressure. The latter effect can become significant with a daily consumption of 50 g or more of liquorice candy for as little as two weeks. By increasing prostaglandins, liquorice is also a mild laxative, and has several other varied uses in herbal medicine.

Comparative studies of pregnant women suggest that excessive amounts of liquorice (100 g a week) may adversely affect both IQ and behaviour traits of offspring.

Some people report that black liquorice candy causes their stools to become green, although this is probably due to the blue food colouring used by many manufacturers. Alexander the Great supplied his troops with rations of liquorice root whilst marching, because of its thirst-quenching qualities.

An excessive amount of black liquorice consumption can cause a chloride-resistant metabolic alkalosis.

The U.S. Food and Drug Administration (FDA) advises that black liquorice contains the compound glycyrrhizin, which is the sweetening compound derived from liquorice root. Glycyrrhizin can cause potassium levels in the body to fall. When that happens, some people experience abnormal heart rhythms, as well as high blood pressure, edema (swelling), lethargy, and congestive heart failure.

Red liquorice wheels

In many countries there is also a product sometimes known as red liquorice, which is extruded in a way to resemble liquorice strings, but made with strawberry, cherry, raspberry, or cinnamon flavourings as the main flavourings rather than liquorice. More recently similar products have been introduced in a wider variety of colours and flavours including apple, mango, blackcurrant, and watermelon, among others. Twizzlers (by Hersheys) and Red Vines are the best-known product brands of this type in the United States; in Australia they are produced by Darrell Lea and several other companies. While the common name for this candy has now become "red liquorice", or often simply "liquorice", it does not taste of liquorice. "Black" in "black

liquorice"/"licorice" would formerly have been redundant and has become a retronym in North America.

Candy has a long history as a familiar food treat that is available in many varieties. Candy is also referred to as sweets or confectionary. Candy varieties are influenced by the size of the sugar crystals, aeration, sugar concentrations, colour and the types of sugar used. Jelly candies, such as gumdrops and gummies, use stabilizers including starch, pectin or gelatin. Simple sugar or sucrose is turned into candy by dissolving it in water, concentrating this solution through cooking and allowing the mass either to form a mutable solid or to re crystallize. Other sugars, sugar substitutes, and corn syrup are also used. Another type of candy is cotton candy, which is made from spun sugar.

History

Before sugar was readily available, candy was made from honey. Honey was used in Ancient China, Middle East, Egypt, Greece and the Roman Empire to coat fruits and flowers to preserve them or to create forms of candy. Candy is still served in this form today, though now it is more typically seen as a type of garnish.

Candy was originally a form of medicine, either used to calm the digestive system or cool a sore throat. In the Middle Ages candy appeared on the tables of only the most wealthy at first. At that time it began as a combination of spices and sugar that was used as an aid to digestive problems. Digestive problems were very common during this time due to the constant consumption of food that was neither fresh nor well balanced. Banquet hosts would typically serve these types of 'candies' at banquets for their guests. One of these candies, sometimes referred to as a 'chamber spice', was made with cloves, ginger, aniseed, juniper berries, almonds and pine kernels dipped in melted sugar.

In the United States

The first candy came to America in the early eighteenth century from Britain and France. Only a few of the early colonists were proficient in sugar work and were able to provide the sugary treats for the very wealthy. Rock candy, made from crystallized sugar, was the simplest form of

candy, but even this basic form of sugar was considered a luxury and was only attainable by the rich. In contrast, since 1979 the world has produced more sugar than can be sold, making it very attainable and cheap.

The candy business underwent a drastic change in the 1830s when technological advances and the availability of sugar opened up the market. The new market was not only for the enjoyment of the rich but also for the pleasure of the working class as well. There was also an increasing market for children. Confectioners were no longer the venue for the wealthy and high class but for children as well. While some fine confectioners remained, the candy store became a staple of the child of the American working class. Penny candies epitomized this transformation of candy. Penny candy became the first material good that children spent their own money on. For this reason candy store-owners relied almost entirely on the business of children to keep them running. Even penny candies were directly descended from medicated lozenges that held bitter medicine in a hard sugar coating. In 1847, the invention of the candy press (also known as a toy machine) made it possible to produce multiple shapes and sizes of candy at once. In 1851, confectioners began to use a revolving steam pan to assist in boiling sugar. This transformation meant that the candy maker was no longer required to continuously stir the boiling sugar. The heat from the surface of the pan was also much more evenly distributed and made it less likely the sugar would burn. These innovations made it possible for only one or two people to successfully run a candy business.

Classification

Chemically, sugar candies are broadly divided into two groups: crystalline candies and amorphous candies.[8] Crystalline candies are not as hard as crystals of the mineral variety, but derive their name and their texture from their microscopically organized sugar structure, formed through a process of crystallization, which makes them easy to bite or cut into. Fudge, creams, and fondant are examples of crystalline candies. Amorphous candies have a disorganized crystalline structure. They usually have higher sugar concentrations, and the texture may be chewy, hard, or brittle. Caramels, nut brittles and toffees are examples of amorphous candies. Commercially, candies are often divided into three groups, according to the amount of sugar they contain:

- 100% sugar (or nearly so), such as hard candies or creams
- 95% sugar or more, with up to 5% other ingredients, such as marshmallows or nougats, and
- 75 to 95% sugar, with 5 to 25% other ingredients, such as fudge or caramels.

Each of these three groups contains both crystalline and amorphous candies.

Manufacture

Pantteri is a Finnish candy. The colored ones are fruity, while black are salmiakki(salty liquorice-flavored), a flavor popular in Nordic and Baltic countries.

Candy is made by dissolving sugar in water or milk to form a syrup, which is boiled until it reaches the desired concentration or starts to caramelize. The type of candy depends on the ingredients and how long the mixture is boiled. Candy comes in a wide variety of textures, from soft and chewy to hard and brittle. Some examples are: caramel candy, toffee, fudge, praline, tablet, gumdrops, jelly beans, rock candy, lollipops, taffy, cotton candy, candy canes, peppermint sticks, peanut brittle, chocolate-coated raisins or peanuts, hard candy(called boiled sweets in British English) and candy bars.

Sugar stages

The final texture of candy depends on the sugar concentration. As the syrup is heated, it boils, water evaporates, the sugar concentration increases, and the boiling point rises. A given temperature corresponds to a particular sugar concentration. In general, higher temperatures and greater sugar concentrations result in hard, brittle candies, and lower temperatures result in softer candies. The stages of sugar cooking are as follows:

Stage	Temperature	Sugar concentration
thread (e.g. <u>syrup</u>)	110 to 112 °C (230 to 234 °F)	80%
soft ball (e.g. <u>fudge</u>)	112 to 116 °C (234 to 241 °F)	85%

firm ball (e.g. soft <u>caramel candy</u>)	118 to 120 °C (244 to 248 °F)	87%
hard ball (e.g. <u>nougat</u>)	121 to 130 °C (250 to 266 °F)	90%
soft crack (e.g. <u>salt water taffy</u>)	132 to 143 °C (270 to 289 °F)	95%
hard crack (e.g. <u>toffee</u>)	146 to 154 °C (295 to 309 °F)	99%
clear liquid	160 °C (320 °F)	100%
brown liquid (e.g. liquid <u>caramel</u>)	170 °C (338 °F)	100%
burnt sugar	177 °C (351 °F)	100%

The names come from the methods used to test the syrup before thermometers became affordable. The "thread" stage is tested by cooling a little syrup, and pulling it between the thumb and forefinger. When the correct stage is reached, a thread will form. This stage is used for making syrups. For subsequent stages, a small spoonful of syrup is dropped into cold water, and the characteristics of the resulting lump are evaluated to determine the concentration of the syrup. A smooth lump indicates "ball" stages, with the corresponding hardness described. At the "soft crack" stage, the syrup forms threads that are just pliable. At the "hard crack" stage, the threads are brittle. This method is still used today in some kitchens. A candy thermometer is more convenient, but has the drawback of not automatically adjusting for local conditions such as altitude, as the cold water test does.

Once the syrup reaches 171 °C (340 °F) or higher, the sucrose molecules break down into many simpler sugars, creating an amber-colored substance known as caramel. This should not be confused with caramel candy, although it is the candy's main flavoring.

Candy and vegetarianism

Some candy, including marshmallows and gummi bears, contain gelatin derived from animal collagen, a protein found in skin and bones, and is thus avoided by vegans and some vegetarians. "Kosher gelatin" is also unsuitable for vegetarians and vegans, as it is derived from fish bones. Other substances, such as agar, pectin, starch and gum arabic may also be used as setting and gelling agents, and can be used in place of gelatin.

Other ingredients commonly found in candy that are not suitable for vegetarian or vegan diets include carmine, a red dye made from cochineal beetles, and confectioner's glaze, which may contain wings or other insect parts.

Shelf life

Because of its high sugar concentration, bacteria are not usually able to grow in candy. As a result, the shelf life of candy is longer than for many foods. Most candies can be safely stored in their original packaging at room temperature in a dry, dark cupboard for months or years. As a rule, the softer the candy or the damper the storage area, the sooner it goes stale. Shelf life considerations with most candies are focused on appearance, taste, and texture, rather than about the potential for food poisoning. That is, old candy may not look pretty or taste very good, even though it is very unlikely to make the eater sick. Candy can be made unsafe by storing it badly, such as in a wet, moldy area. Typical recommendations are these:

- Hard candy may last indefinitely in good storage conditions.
- Milk chocolates and caramels usually become stale after about one year.
- Dark chocolate lasts up to two years.
- Soft or creamy candies, like candy corn, may last 8 to 10 months in ideal conditions.
- Chewing gum and gumballs may stay fresh as long as 8 months after manufacture.

Chapter 12

Health aspects of Candies

Cavities

Candy generally contains sugar, which can be involved in tooth decay causing cavities. Sugar is a food for several types of bacteria commonly found in the mouth, particularly *Streptococcus mutans*; when the bacteria metabolize the sugar they create acids in the mouth which demineralize the tooth enamel and can lead to dental caries. To help prevent this dentists recommend that individuals should brush their teeth regularly, particularly after every meal and snack.

Sugar is often cited as the source of insufficient dentistry, but is in fact the streptococcus bacteria that feed on sugar, not the sweet substance itself, that causes poor teeth. The bacteria eats away tooth enamel the longer it stays in contact with teeth, so the amount of sugar consumed is less important than the time it is left on and in between the teeth.

Candies that primarily consist of peppermint and mint, such as candy canes, have digestive benefits. Peppermint oil can help soothe an upset stomach by creating defense against irritable bowel syndrome and is effective in killing germs.

Mint-flavored gum increases short-term memory, heart rate, and the amount of oxygen in the brain. The correlation between heart rate and oxygen in the brain triggers short-term memory. Chewing gum can also provide a burst of insulin in the anticipation for food.

When eaten in moderation, dark chocolate can have health benefits. The cocoa in chocolate can help reduce the risk of heart disease. Vitamins and minerals such as calcium, magnesium, and sodium can be found in chocolate, as well as antioxidants. In a study of approximately 8,000 individuals, candy consumers enjoyed an average of 0.92 years of longer life, with greater consumption of candy not associated with progressively lower mortality. Non-consumers typically ate less red meat and salads, drank more and were more likely to smoke. Mortality was lowest among those consuming candy 1–3 times a month and highest among those consuming candy three or more times a week. The study concluded that one possible explanation for this was the presence of antioxidant phenols in chocolate, but the study could not differentiate between consumption of sugar candy and chocolate in their study.

Glycemic index

Most candy, particularly low-fat candy, has a high glycemic index (GI), which means that it causes a rapid rise in blood sugar levels after ingestion. This is chiefly a concern for people with diabetes, but could also be dangerous to the health of non-diabetics.

Health benefits

Jelly beans

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Contamination

Some kinds of candy have been contaminated with an excessive amount of lead in it.

Choking deaths

Hard, round candies is a leading cause of choking deaths in children. Some types of candy, such as Lychee Mini Fruity Gels, have been associated with so many choking deaths that their import or manufacture is banned by some countries.

Packaging

Purposes of packaging

Packaging preserves aroma and flavor and eases shipping and dispensation. Wax paper seals against air, moisture, dust, and germs, while cellophane is valued by packagers for its transparency and resistance to grease, odors and moisture. In addition, it is often resealable. Polyethylene is another form of film sealed with heat, and this material is often used to make bags in bulk packaging. Saran wraps are also common. Aluminum foils wrap chocolate bars and prevent transfer of water vapor, while being lightweight, non-toxic and odor proof. Vegetable parchment lines boxes of high-quality confections like gourmet chocolates. Cardboard cartons are less common, though they offer many options concerning thickness and movement of water and oil.

Packages are often sealed with a starch-based adhesive derived from tapioca, potato, wheat, sago, or sweet potato. Occasionally, glues are made from the bones and skin of cattle and hogs for a stronger and more flexible product, but this is not as common because of the expense.

History

Prior to the 1900s, candy was commonly sold unwrapped from carts in the street, where it was exposed to dirt and insects. By 1914 there were some machines to wrap gum and stick candies, but this was not the common practice. After the polio outbreak in 1916, unwrapped candies garnered widespread censure because of the dirt and germs. At the time, only upscale candy stores used glass jars. With advancements in technology wax paper was adopted, and foil and cellophane were

Marketing and design

Packaging helps market the product as well. Manufacturers know that candy must be hygienic and attractive to customers. In the children's market quantity, novelty, large size and bright colors are the top sellers. Many companies redesign the packaging to maintain consumer appeal.

Top-selling candies

The table below summarizes some of the top candy brands in the world.

Country	Top brand	Description
United States	Reese's Peanut Butter Cups	Reese's Peanut Butter Cups are round chocolate disks that are filled with a sweet, creamy peanut butter filling. The cups were first manufactured in 1928 by the Hershey's company.
United Kingdom	Cadbury's Dairy Milk	Cadbury's Dairy Milk is a chocolate bar that brags to have a glass and a half of milk in every bar. This chocolate treat was created in 1904 and became an instant hit following its initial sales in 1905. Cadbury was bought out by Kraft Foods in 2010.
Saudi Arabia	Galaxy bar	Galaxy caramel bars are the top-sold candy in Saudi Arabia. The bars are milk chocolate with a caramel filling, and are made by Mars Inc. This same candy is known as Dove in the United States.

M&M's are milk chocolate drops with a colorful candy coating on the outside. The candies were first manufactured in 1941 and were given to American soldiers serving in the Second World War. M&M's are manufactured by Mars Inc.

Reese's Peanut Butter Cups are round chocolate disks that are filled with a sweet, creamy peanut butter filling. The cups were first manufactured in 1928 by the Hershey's company.

Cadbury's Dairy Milk is a chocolate bar that brags to have a glass and a half of milk in every bar. This chocolate treat was created in 1904 and became an instant hit following its initial sales in 1905. Cadbury was bought out by Kraft Foods in 2010.

Galaxy caramel bars are the top-sold candy in Saudi Arabia. The bars are milk chocolate with a caramel filling, and are made by Mars Inc. This same candy is known as Dove in the United States.

Orbit gum first got its name during the Second World War when Wrigley shipped all of their chewing gum overseas to the troops and began manufacturing gum for the civilians under the name of Orbit. After the war, the name Orbit disappeared again. In the 1970s, Wrigley began selling sugar-free gum under the name of Orbit in European countries. It was not until 2001 that Orbit gum returned to the United States.

Alpen Gold is a brand of chocolate produced in Russia. They sell chocolate bars, pralines, and boxes of chocolates. Their chocolate often includes ingredients such as raisins, nuts, and liqueur.

Cadbury's Dairy Milk is a chocolate bar that brags to have a glass and a half of milk in every bar. This chocolate treat was created in 1904 and became an instant hit following its initial sales in 1905.

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