Baking
COOKIES

BAKERguide Vol. 1-3

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Table of Contents

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INTRODUCTION

Cookies are the world's favorite treat, they are a universal symbol of comfort and indulgence that transcends cultures and generations. From classic chocolate chips to innovative flavor combinations like matcha cookies, the world of cookies is a canvas for creativity and culinary artistry. As consumer preferences shift towards healthier and sustainable options, the cookie industry is evolving, embracing new ingredients and production methods that cater to these demands. This exploration highlights the fascinating journey of cookie creation, where tradition meets innovation, and every bite tells a story of passion, quality, and craftsmanship. Join us as we celebrate the irresistible charm of cookies!

The cookie market was valued at around 12.14 billion USD and is expected to grow at a compound annual rate (CAGR) of 9.10% from 2024 to 2029. Market growth is moved by current consumers' health trends motivated by concerns around obesity, diabetes, and other chronic disease. Some of the most up-to-date trends for cookies are fortified, functional, low-fat, and sugar-free cookies.

Cookie Market Opportunities

- The current cookie market is valued at USD 12.14 billion as of 2024.
- The cookie market is expected to grow at a compound annual rate (CAGR) of 9.10 % from 2024 to 2029.
- The most significant driver of the market growth is the expanding consumer need and desire for delicious, clean-label, and high-quality ingredients.
- One of the most important current market trends is fortified and functional cookies, motivated by health-conscious consumers.

Source: Mordor Intelligence Market Researcharket Company. "Cookies Market Size: Mordor Intelligence.",. Accessed 05 Dec. 2024.

WHAT ARE COOKIES?

Cookies are baked treats. A cookie is a small sweet, crispy, or cake-like pastry most often made with flour, sugar, liquid, and fat. They are characterized by:

- High sugar content
- High-fat content
- Low moisture

COOKIE FUN FACT

*The cookie's name is derived from the Dutch word **koekje**, meaning **"little cake."** The earliest cookie dates as far back as the 7th century A.D. in Persia, where sugar was first cultivated. In England and the British colonies, cookies are also called biscuits. Germans call them Keks, or Plätzchen, and Spaniards call them **galletas**. In Italy, there are several forms of cookies, including amaretti and biscotti. The most popular cookie flavor in America is chocolate chip.*

COOKIE TYPES

BAKER pedia

Hard and Semi-sweet

Short-dough

Pressed Cookies

Drop Cookie

Bar Cookie

Molded Cookies

Rolled or Cutout Cookies

Sandwich Cookies

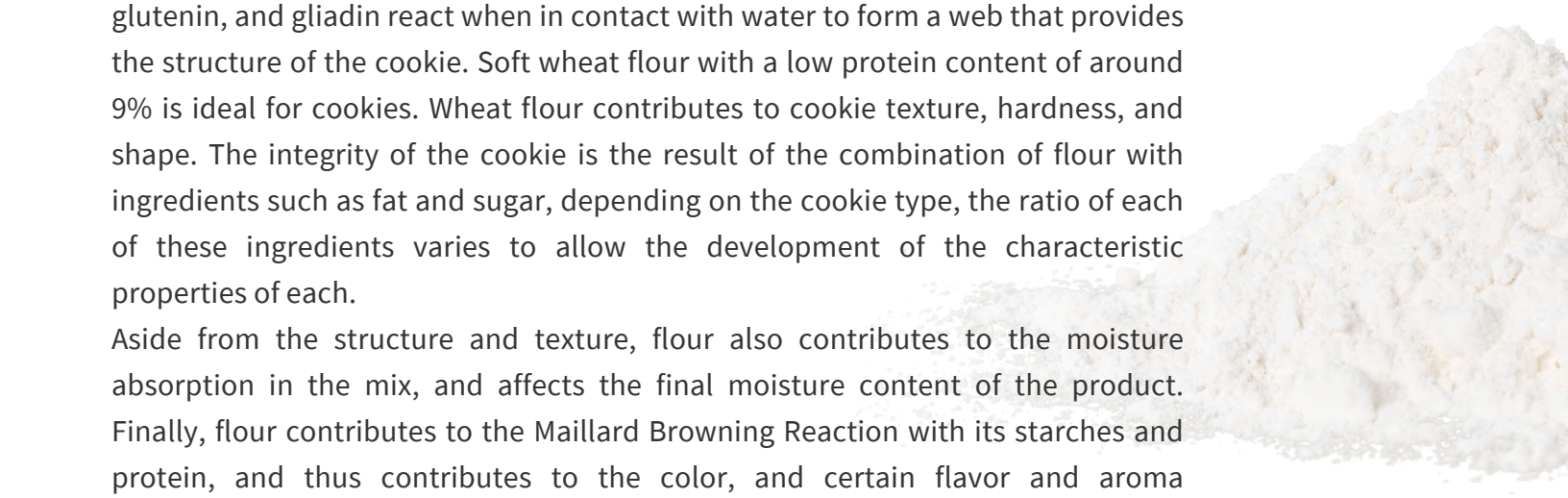
INGREDIENTS

Cookies are made with a wide variety of ingredients, some are basic in most formulations while others are specific for each type of cookie. In the following section, both basic and special ingredients are discussed.

Flour

Flour is the main structure builder in most baked goods, proteins present in flour, glutenin, and gliadin react when in contact with water to form a web that provides the structure of the cookie. Soft wheat flour with a low protein content of around 9% is ideal for cookies. Wheat flour contributes to cookie texture, hardness, and shape. The integrity of the cookie is the result of the combination of flour with ingredients such as fat and sugar, depending on the cookie type, the ratio of each of these ingredients varies to allow the development of the characteristic properties of each.

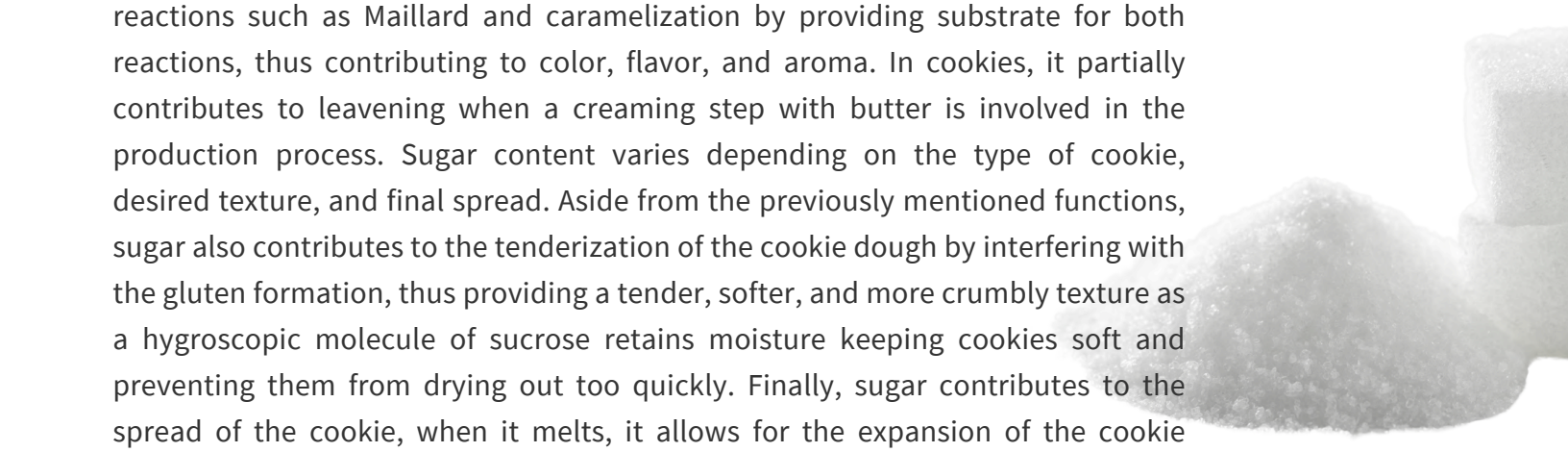
Aside from the structure and texture, flour also contributes to the moisture absorption in the mix, and affects the final moisture content of the product. Finally, flour contributes to the Maillard Browning Reaction with its starches and protein, and thus contributes to the color, and certain flavor and aroma compounds.



Sweeteners

SUGAR (SUCROSE)

Sugar (sucrose) is a key ingredient in cookie making. It provides sweetness and helps to create a moist and tender texture. It also participates in browning reactions such as Maillard and caramelization by providing substrate for both reactions, thus contributing to color, flavor, and aroma. In cookies, it partially contributes to leavening when a creaming step with butter is involved in the production process. Sugar content varies depending on the type of cookie, desired texture, and final spread. Aside from the previously mentioned functions, sugar also contributes to the tenderization of the cookie dough by interfering with the gluten formation, thus providing a tender, softer, and more crumbly texture as a hygroscopic molecule of sucrose retains moisture keeping cookies soft and preventing them from drying out too quickly. Finally, sugar contributes to the spread of the cookie, when it melts, it allows for the expansion of the cookie creating the desired texture.



BROWN SUGAR

Brown sugar is the resulting brownish-colored crystal from the sugar production process usually made by combining white sugar with molasses, it has a slight coat of molasses that provides distinctive flavor and color to baked goods, and also provides slight moisture to the product. Its function in cookies is similar to that of white sugar, but it provides a richer more complex flavor, darker colors due to the presence of reducing sugars, and contributes to a more tender texture due to the increased moistness given by the syrup.

POWDERED SUGAR

Powdered sugar is sucrose that has been reduced in particle size from a crystal to a fine powder. It is usually used for the topping of crinkle cookies to provide a sweet flavor during consumption. Similarly to sucrose, it provides sweetness and tenderizes by interfering with gluten formation when used in the dough. It acts as a water retention agent due to its hygroscopic nature and thus aids in improving microbial deterioration. It can also be used in fillings as a structure stabilizer.

INVERT SUGAR

Invert sugar is made from sucrose heated with a small quantity of acid, such as citric acid. After the hydrolysis reaction, a mix of glucose and fructose is obtained, and neutralized by the addition of sodium bicarbonate. The effect of invert sugar in cookies is slightly different from sucrose, the syrup is sweeter than sucrose and thus will require lower quantities to accomplish the desired sweetness. It also contributes to the moistness of the product providing a more tender and chewy texture to the cookie. Finally, it has a significant impact on the color of the cookie due to its increased presence of reducing sugars caused by the inversion.

HONEY

Honey is a syrup that can essentially be defined as a type of inverted sugar obtained from honeybees. It is commonly used due to its flavor profile, characteristic of each region due to the flowers involved in the pollination process. It's highly expensive, and its use is usually restricted to specialty items that require is more complex flavor profile. It contributes to moistness, producing more tender and softer cookies, with slightly darker color due to the presence of reducing sugars that can participate in the Maillard Browning reaction. Finally, it provides a characteristic floral and caramel-like note.

HIGH FRUCTOSE CORN SYRUP (HFCS)

High Fructose Corn Syrup (HFCS) is a type of glucose syrup obtained from the enzymatic reaction of dextrose isomerase of glucose syrup, this results in a mixture of glucose and fructose. Functionally, they are very similar to invert sugar syrups and can be substituted 1: 1 with them in cookie formulation. Similarly to invert sugar, HFCS provides moistness to cookies producing tender and softer products. It also aids in the control of crystallization, and can also aid in controlling microbial growth by producing higher osmotic pressure than sucrose and thus reducing the availability of water for microbial growth. Finally, just as invert sugar it imparts sweetness and substrate for Maillard browning reaction.

Fat

Fat is another key ingredient in cookie production, it is the most important tenderizing agent in cookies. Fat from butter, margarine, or shortening coat flour particles, inhibiting gluten formation and thus resulting in a soft and tender crumb. Fat from animal sources provides a deep and rich flavor to cookies, enhancing the overall taste of the cookie. Another function of fat in cookies is their moisture retention capacity preventing them from drying out and providing a soft and chewy texture, and appealing appearance. One of the most important functions of fats in cookies is correlated to the spread and structure properties, the type and concentration of the fat directly impact cookie spread. Higher fat content generally produce an increment in cookie spread giving thinner and crispier cookies. While, lower concentrations of fat result in chewier and softer cookies. Finding the ideal balance of fats for the desired cookie type is key in cookie production. Using fat with higher melting points can result in thicker cookies with better shape retention. Fat also aids in the lubrication of dry ingredients allowing for mixing and better incorporation of ingredients, and it may also aid airing by creaming.

Finally, fat delays staling by delaying the starch gelatinization process keeping cookies fresh and appealing for longer periods.

FUN FACT

*The term **"shortening"** refers to the ability of fat to "shorten" gluten strands, contributing to a tender crumb*

Eggs

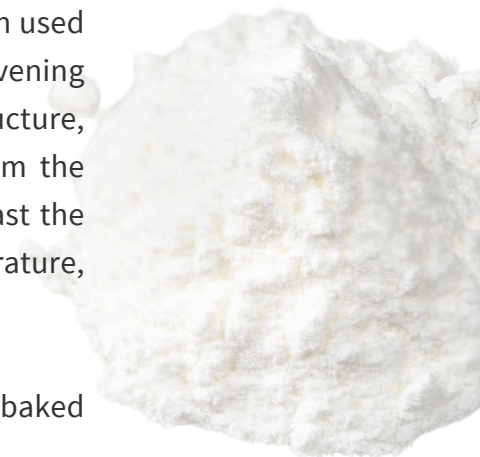
Eggs are a primordial ingredient in cookie production, they serve several functions in this type of baked goods. Initially, eggs act as a binder by holding ingredients together. Another important function of eggs is their importance on the structure and stability of the cookie. When baked, egg proteins coagulate and create a stable structure preventing the collapse of the cookie. Eggs provide moisture to the cookie dough, especially from egg whites; they contain around 75% of moisture which allows cookies to remain soft and chewy. Egg yolk enhances the richness and tenderness of the cookie. Finally, egg protein contributes as a substrate for the Maillard Browning reaction, thus providing color, flavor, and aroma compounds.

Egg whites can provide leavening to cookies when whipped they produce a foam that entraps air and provides volume.

Impact of Egg on Cookies

- **Whole Egg:** Using whole eggs generally results in cookies that are moist and rich due to the balance of fat and protein.
- **Egg Yolks:** Cookies made with additional yolks tend to be denser, more orange and richer.
- **Egg Whites:** Recipes that utilize more egg whites may yield lighter and airier cookies but can also lead to drier textures if not balanced correctly with fats.

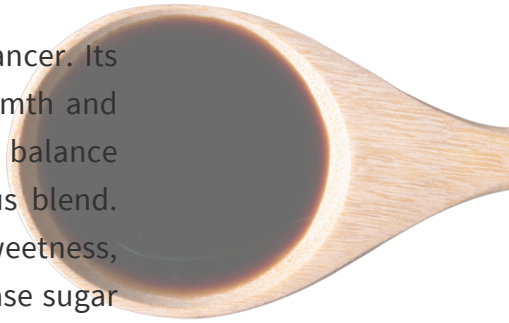
Chemical Leavening



Chemical leavening agents such as baking powder and baking soda are often used in cookies to create a rise in carbon dioxide production. Chemical leavening systems are the key to high-quality products. The volume, density, cell structure, and texture of the baked goods are determined by the gas produced from the leavening system used in the formula. The speed of the reaction, or how fast the leavening system produces gas is affected by factors like acid type, temperature, water activity, and the type or ratio used.

In cookies, the effect of chemical leavenings is less, as compared to other baked goods, due to the nature of the baked goods and its desired final texture.

Vanilla



Vanilla plays a vital role in cookie production, primarily as a flavor enhancer. Its aromatic compounds contribute to the overall taste profile, adding warmth and depth that elevate the sweetness of the cookies. Vanilla also helps to balance other flavors, such as chocolate or spices, creating a more harmonious blend. Additionally, the presence of vanilla can enhance the perception of sweetness, allowing for a more satisfying taste experience without needing to increase sugar content.

Emulsifiers

Emulsifiers play a key role in the baking industry, influencing the physicochemical properties of baked goods. Functioning as stabilizers, these compounds facilitate the dispersion of water and fat phases within the dough or batter matrixes, as well as in frosting and fillings. In cookies, when emulsifiers are used the fat phase is spread uniformly over the hydrophilic ingredients, thus improving the performance of the fats in disrupting the gluten formation this produces cookies with a softer and tender texture.

Commonly used emulsifiers in cookie production are:

- **Mono and diglycerides:** are synthetic ingredients, and they are esters of glycerol and fatty acids. They can contribute to a softer crumb structure, making cookies tender and pleasant to eat. They can also help stabilize air bubbles in the dough, improving gas retention during baking. Resulting in better volume and texture of the cookies, contributing to a lighter product.
- **Lecithin:** is a natural ingredient obtained from egg yolk or soybean, most commercially available lecithin is obtained from the latter. Its action as an emulsifier comes from its phospholipids that have a strong polar affinity. It is usually used relative to either flour weight or fat weight, in the ranges of 0.5 - 1.0% for flour and up to 2% for fat. Using lecithin in the mentioned ranges can improve dough smoothness, and reduce fat content up to 10%. For ideal usage, it is recommended its dissolution in the fat previous addition to the dough.

Learn more about Emulsifiers in our Emulsifiers Pocket Guide!

Enzymes

Enzymes are ingredients of biological origin used as catalysts for a wide range of reactions. Commonly three types of enzymes are used in cookies:

- **Proteases:** they act on gluten formation, and thus influence the texture of the cookie. Cookies made with the addition of proteases result in a more open and tender crumb, improving cookie spreadability and tenderness.
- **Hemicellulase:** it may contribute to a better cookie spread is cellulase, which ruptures the linkages between starch and protein molecules allowing cookie dough to spread further. In some cookies high in fiber, additional water may be required to reduce the hardness; usage of hemicellulose reduces the need for excessing water favoring cookie structure while aiding in the softening of the cookie texture.
- **Amylase:** the addition of amylase increases the spread factor and decreases the hardness of cookies. Beta-amylase produces a similar effect to alpha-amylase on a lower level, due to the lower starch damage commonly found in cookie flours.

Chelating Agents

Chelating agents are ingredients used as antioxidant agents that help retard the beginning and progression of the rancidity reaction of fats by sequestering agents that can accelerate this reaction. Given its antioxidant properties these ingredients can be used to extend the shelf life of cookies by retarding the oxidation process of its fats.

In cookie production, the most commonly used antioxidants are Butylated Hydroxyanisole (BHA), Butylated Hydroxytoluene (BHT), and Tertiarybutylhydroquinione (TBHQ). They work by preventing the formation of free radicals that can initiate and propagate the oxidation of fats.

- **Butylated Hydroxyanisole (BHA):** it is insoluble in water, and works well in both dough and final product. It is effective in animal fats, but not ideal for vegetable fats.
- **Butylated Hydroxytoluene (BHT):** it is insoluble in water, and works well in both dough and final product. It is effective in animal fats, but not ideal for vegetable fats. It is a cheaper alternative to BHA.

- **Tertiarybutylhydroquinione (TBHQ):** is the most commonly used chelating agent in cookies. It is the most effective among other antioxidants, it has a good performance in both animal and vegetable fats and has good carry-through properties.

Most of these ingredients are used at levels that may not exceed 0.02% based on fat weight. They are directly added to the fats, usually added at early stages or by the fat provider.

Natural clean-label alternatives to these ingredients are been studied by food scientists, some of the most promising alternatives are bamboo leaves, tea polyphenols, and vitamin E. Usage of green tea leaves extract at 1% has shown to exhibit an excellent antioxidant effect on the biscuits lipid stability.

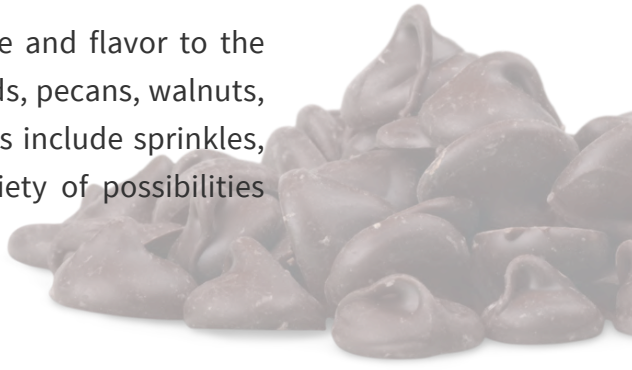
Spices

Spices provide interesting flavor profiles to cookies, and can also aid in enhancing the overall taste. In addition, these spices also have natural anti-molding properties.

- **Cinnamon:** cinnamon adds warmth and sweetness. It is often paired with other spices to create a comforting flavor profile.
- **Ground ginger or fresh ginger:** provides a spicy kick and depth. It is particularly prominent in gingerbread and ginger snap cookies.
- **Nutmeg:** adds a warm, nutty flavor that complements other spices like cinnamon and cloves. It is often used in holiday cookies.
- **Cloves:** Cloves offer a strong, aromatic flavor that can be quite potent. They are typically used in small amounts to enhance the spiciness of cookies.

Inclusions

Inclusions are often used in cookie production to add texture and flavor to the product. It ranges from chocolate chips to nuts such as almonds, pecans, walnuts, peanuts, and macadamia nuts, among others. Other inclusions include sprinkles, cranberry, and raisins. The cookie world has an infinite variety of possibilities available for all consumer's tastes.



COOKIE PROCESSING

Cookies are made following a similar process, depending on their shape and type, the forming step may vary depending on the cookie type. Machine-deposited cookies can be wire-cut, rotary-cut, or made in pans with special shapes like wafers.

1

Ingredient Preparation

HIngredients such as flour, sugar, and oils are stored in bulk and measured accurately. Mixing occurs in large industrial mixers, where dry ingredients are combined before liquid components are added to form a uniform dough. The mixing of cookie dough is to ensure homogeneity and as long as that is achieved, mixing should be stopped. Over-mixing results in the breaking down of the sugars and fat, which may affect the quality of the cookie.

2

Dough Formation

The mixed dough is shaped using automated forming machines that create uniform pieces, ensuring consistent size and thickness across the batch. This is usually done in wire-cut depositors, extruders, or double extruders (for filled cookies), and deposited onto baking pans.

3

Baking

The shaped cookie dough is transferred to baking ovens, often designed as tunnel ovens, which provide controlled baking conditions for optimal texture and flavor development. Cookie baking temperature ranges from 191 - 204 °C (375 - 400 °F).

Cookie Type	Baking Temperature
Oatmeal-Raisin Cookies	177 - 182 °C (350 - 375 °F)
Sugar Cookies	191 - 204 °C (375 - 400 °F)
Chocolate Chip Cookie	191 - 204 °C (375 - 400 °F)

4

Cooling

After baking, cookies are cooled on conveyor belts to room temperature, allowing them to set properly and preventing moisture retention. Cool cookies till an internal temperature of 32-35 ℃ (90-95 ℉).

5

Packaging

Once cooled and inspected, cookies are packaged using automated systems, which may include individual wrapping or bulk packaging for retail distribution.

6

Storage and Distribution

Packaged cookies are stored under appropriate conditions before being distributed to retailers or consumers.

COOKIE FORMULATION

Developing a cookie formula involves carefully selecting ingredients and determining the appropriate ratios and baking times. It is important to consider the cookie type to be formulated and other factors such as flavor, texture, and shelf life when creating a recipe.

Chocolate Chip Cookie

Ingredient	Baker's % (based on flour weight)
Flour (all-purpose or cake flour)	100%
Fat (Butter or margarine)	55%
Sugar (granulated)	51%
Chocolate Chips	30%
Water	19%
Eggs	2%
Baking Powder	0.96%
Salt	0.96%
Vanilla	0.96%

Table 1: Chocolate Chip Cookie Formulation

Sugar Cookie

Ingredient	Baker's % (based on flour weight)
Sugar	30 – 48%
Butter or shortening	13 – 35 %
Flour	100%
Eggs	2 – 5%
Vanilla	Varies
Leavening Agents	0.35 – 0.5 %

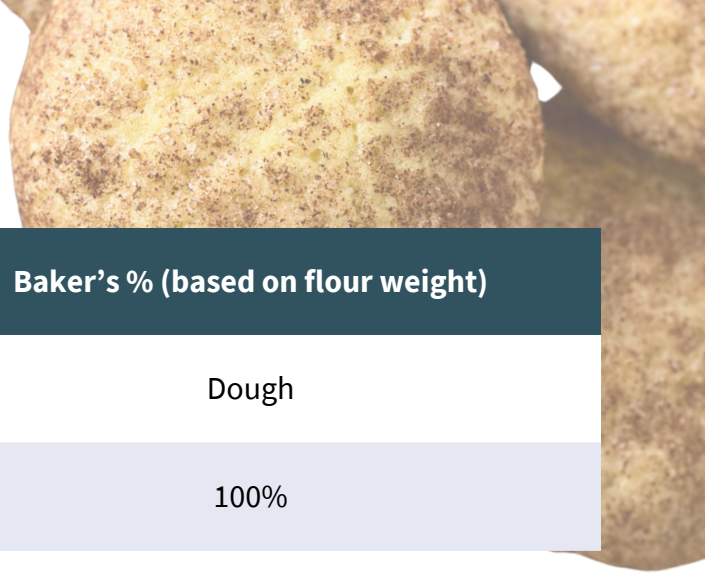
Table 2: Sugar Cookie Formulation

Peanut Butter Cookie

Ingredient	Baker's % (based on flour weight)
Peanut Butter	139%
Flour	100%
Fat	63%
Sugar	56% of each type
Flavor	2.80%
Leavening	1.70%
Salt	<0.1%

Table 3: Peanut Butter Formulation

Snickerdoodle



Ingredient	Baker's % (based on flour weight)
Dough	Dough
Pastry or all-purpose flour	100%
Unsalted butter (melted or softened)	60%
Granulated sugar	100%
Liquid whole eggs	25%
Vanilla extract	4%
Salt	3%
Baking powder	1%
Ground cinnamon	2%
Dough topping	Dough topping
Granulated sugar	Any amount
Cinnamon, ground	Any amount

Table 4: Snickerdoodle Formulation

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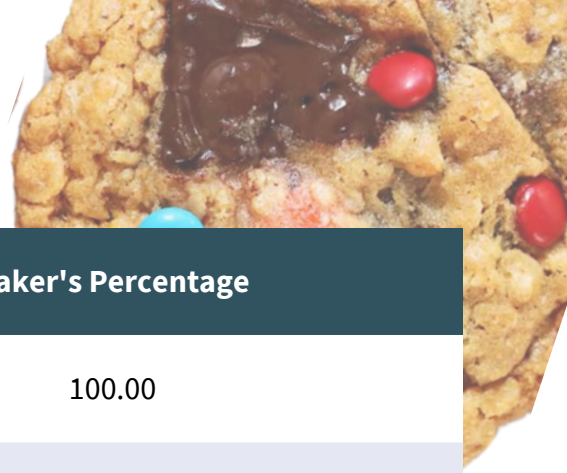
Gingerbread Cookies

Ingredients	Baker's % (based on flour weight)
Butter	44.67%
Brown Sugar	71.32%
Eggs	7.84%
Molasses	26.65%
Flour	100%
Baking Soda	2.51%
Salt	1.1%
Ground Clove	0.63%
Ground Cinnamon	0.94%
Ground Ginger	0.94%
Ground Nutmeg	0.94%

Table 5: Gingerbread Cookie Formulation

As seen in our Seasonal Treats Pocket Guide.
Learn more!

Monster Cookies

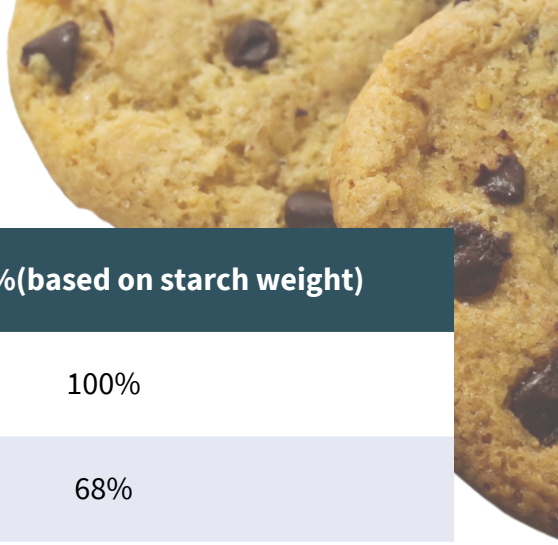


Ingredients	Baker's Percentage
Flour	100.00
Baking Soda	2.86
Baking Powder	2.86
Salt	2.86
Butter	107.62
Brown Sugar	157.14
Peanut Butter	57.90
Honey	20.57
Egg	60.95
Vanilla	4.19
Rolled Oats	95.24
Chocolate Chunks	107.62
Candy Coated Chocolate	80.95
Mini Candy Coated Chocolate	80.95

Table 6: Monster Cookie Formulation

As seen in Scientifically Sweet Monster Cookies Post!

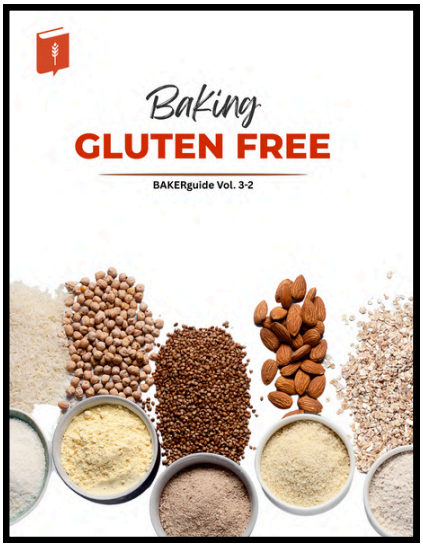
Gluten-Free Cookie



Ingredient	Baker's %(based on starch weight)
Cornstarch	100%
Liquid whole eggs	68%
Coconut oil	29%
Honey	49%
Chocolate Chips	24%
Benexia® Xia Powder 435 W LM	26%
Benexia®chia seed LM	10%
Cocoa Powder	8.5%
Sweetener (Sucralose)	8.4%
Baking Powder	2.5%

Table 7: Gluten-Free Cookie Formulation

As seen in our Baking Gluten-Free Pocket Guide.
Learn more!



COOKIE QUALITY PARAMETERS

Flour is one of the principal ingredients in cookie production with fat and sugar, making up to 30-40% of the total formula. Therefore, its quality and properties are extremely important for manufacturing a high-quality cookie.

Cookie Flour Quality Testing for Spreadability

Cookie flour quality is an important parameter of cookie production. The most common parameter tested in cookie production is the spreadability ratio of the cookie. This parameter is obtained by dividing the width of the cookie by the thickness. It is vital to its packaging requirement. A change in spreadability would cause an increase in waste levels and profitability of a high-output cookie production line.

There are a number of traditional methods to test the protein quality and spreadability of flour. These generally involve baking batches of cookies with different amounts of flour and comparing the final spread. However, this can take up considerable flour amounts and time. They also give mainly information on spreadability, and little information on consistency, stickiness, shape, color, etc. So, while this may be a good starting point, there is much more to cookie flour quality.

Cookie Flour Quality Testing

Cookie flour can be tested using traditional methods such as the AACCI (Cereal and Grains Association) methods. These methods can be used to describe product characteristics such as cookie density, flour types, flour treatments, and ingredients, that affect cookie geometry. While traditional methods can give interesting information about other parameters aside from spreadability, considerations in cookie formulation and operational parameters (temperature and baking time) should be taken into account depending on the type of cookie, thus novel technologies allow for a complete understanding of flour quality and its impact on the final product. In the highly competitive cookie and biscuit market, improved quality and consistency goes a long way.

Aside from the spreadability ratio determined in the traditional methods, other parameters of cookie flour quality have an important role in high-speed baking. Other extremely important quality parameters to consider in industrial cookie manufacturing are:

- **Spreadability:** is one of the most important parameters to consider in cookie production. A higher spreadability or spread ratio is commonly desired in most types of cookies. Spreadability is usually associated with wheat proteins that undergo their glass transition during baking. Cookies made with low protein flours < 12% tend to spread more rapidly and for longer periods than cookies made with high protein flours.
- **Consistency:** is dependent on the water absorption capacity (WAC), or the amount of water the flour can absorb to obtain a particular consistency. Water absorption capacity greatly impacts dough and final product characteristics. The consistency and viscosity of the dough depend on the amount of water absorbed by the flour. If a lower amount of water is used, the dough may become hard and dry. However, if the dough has a larger amount of water than necessary, it may become sticky and hard to handle; this will not allow for the formation of the cookies. It is important to mention that not only is the amount of water absorbed by the dough important, but also the components responsible for the absorption of the water. Damaged starch, pentosans, and glutenins contribute to the water-holding capacity, and affect other flour quality parameters as well.
- **Stickiness:** is the adhesion of the dough to surfaces. This may cause several processing problems such as larger cleaning operations and lack of formation of the cookies. Stickiness is caused by over-hydration and damaged starch; over-hydrating cookie dough causes an excessive amount of moisture that can’t be retained by the flour, this may require the addition of more flour or cornstarch. Damaged starch is starch that has been physically ruptured during the milling process, this starch can absorb higher amounts of water, around 2-3 times more than regular starch thus increasing dough moisture which can turn it sticky.

- **Shape:** cookie shape is mainly determined by the thickness and diameter of the product. The appropriate shape is accomplished by controlling two main characteristics: dough extensibility and elasticity. Extensibility is the capacity of the dough to be stretched without breaking, meaning if the dough is capable of keeping its form. Elasticity is the tendency of the dough to return to its original position after deformation. Both of these characteristics are influenced by the quality of the protein.
- **Color:** cookie color is an important organoleptic factor in the consumer's acceptance of the final product. Cookie color is caused by the browning reactions (Maillard reaction and caramelization), both reactions depend on the amount of available reducing sugar, proteins and pH, and of course product formulation.
- **Blisters and cracks:** are considered final product defects caused by the amount of water evaporated during baking. They are influenced by the amount of water in the final dough and the strength of the protein network.

Learn more about Cookie Flour Quality in our Cookie Flour Selection and Quality BAKERpaper!

TROUBLESHOOTING COOKIE PRODUCTION

How can I use chia flour in my cookies? What are the benefits?

Chia flour can be added at up to 10% of the total formulation or with the following substitution level:

- The total substitution is chia flour: wheat flour, which is 1:1. In gluten-free mixes, the ratio is typically 1:3.

It is important to hydrate chia flour before use to increase the water-holding capacity. The use of chia flour provides several benefits, including texture modification, whole-grain appearance, and enhanced nutritional profile.

How can I make cookies crispy outside and gooey on the inside?

It is important to consider the type of sugar used in the formulation. A good mixture of both liquid and granulated sugar will provide a balance of sweetness and moisture. This allows the cookie to remain soft inside and crispy on the outside. Granulated sugar produces crispier cookies, while molasses and corn syrups with their slightly acidic profile and higher moisture content will provide a chewy texture.

Baking temperature and time also influence the texture profile of the cookies. Baking at 160°C (325°F) and slightly increasing baking time will allow the cookies to spread out and cook slower while the edges will get crispier.

What causes chocolate cookies to go paler over their shelf life?

Chocolate cookies go pale due to the fat bloom. This is the migration and crystalization of fat to the surface due to temperature changes. The best way to avoid this problem is to store cookies in a temperature-controlled environment or use an emulsifier to prevent the fat from blooming.

What effect does changing or reducing the shortening content have in cookie formulations?

Fat plays an important role in cookie manufacturing. It provides a coating to inhibit gluten formation, thus softening the cookie. It is also key to the process of creaming. During this step, air is entrapped in a fat-sugar web that aids in leavening while improving texture and volume. If the fat ("shortening" in this case) is reduced, then there should be the addition of suitable emulsifiers, typically at a rate of 1.5% of the original fat weight. This will partially improve some of the functional properties lost from the decreased fat content.

The use of oil, low solid fats, or shortenings may cause several functional problems. They will not coat flour particles properly and their inability to cream to the same extent as solid fats will not provide appropriate mechanical leavening or aeration to the dough. Lower fat content also significantly increases the staling rate of cookies, which must be supported with the use of emulsifiers to ensure a desirable texture over its shelf life.

Can sugar levels be reduced in cookie formulations, and what is the effect of using alternative sweeteners?

Reduction of sugar due to health concerns is beneficial due to a potential decrease in calories. It makes the cookie healthier by reducing its glycemic index. However, the functional properties of alternative sweeteners like sucralose, acesulfame-K, allulose, stevia, or aspartame provide a set of challenges due to their functional properties. These sugar replacers may significantly increase the sweetness of the end product, but it doesn't contribute to the browning of the baked product. The only sugar replacer that provides this browning property is allulose. In addition, sugar brings 'bulk' to a dough. Therefore, a reduction in sugar would reduce the total solids content in your dough. This can be replaced by increasing fiber or protein. Last but not least, the increase in water activity with the reduction of sugar in the formula may increase mold growth. Therefore, anti-mold ingredients like cultured wheat, cultured dextrose, calcium propionate, or potassium sorbate may be needed.

What are the common challenges bakers face in maintaining flavor stability in cookies during the baking process, and how can these challenges be effectively addressed?

Bakers often face challenges in maintaining flavor stability in cookies during the baking process, which can result in a diminished taste experience. High temperatures can degrade traditional flavorings, leading to uneven flavor distribution and inconsistent quality across batches.

High-quality vanilla extracts offer an effective solution to these issues. Formulated for superior heat stability, they retain their rich flavor even under high baking conditions. Their complex flavor profiles enhance the overall taste, while consistent quality ensures uniformity across different cookie batches.

What is the lowest protein quantity of flour required for cookies?

Protein content is one of the most important parameters to consider when baking cookies. Cookie flour typically contains around 7-12% protein content depending on the desired product to be made. Protein content may vary from the lower to the higher end of the range previously mentioned. Crackers may require flours with protein content on the higher end of the range due to their characteristic crispy texture and established shape, while short-doughs use flours with lower protein content to obtain their desired soft and tender texture.

Enzymes such as protease can be added to cookie formulation to aid in the inhibition of gluten formation and elasticity. This helps prevent dough shrinkage after molding and sheeting.

How can I ensure the right water absorption for cookie dough?

Cookies are characterized by their low moisture content (3-5%) and by their soft and tender texture. This is accomplished using low protein flour with low starch damage and low pentosan content that reduces water hydration capacity. Typical cookie flour content should be between 12-14% to ensure proper water hydration. Other ingredients that contribute to water content should be taken into account (e.g eggs, vanilla essence) so the formulation is balanced.

Several instrumental methods are available to measure the water absorption capacity of cookie flour.

Which enzymes can I use to correct my flour for cookies?

Several studies have found that the addition of enzymes to cookie formulation can have beneficial effects on cookie spreadability and tenderness. The addition of alpha-amylase to flour significantly increases the spread factor and decreases the hardness of cookies made with the addition of 100 units of the enzyme in 100 grams of flour. Beta-amylase produces a similar effect to alpha-amylase on a lower level, due to the lower starch damage commonly found in cookie flours. Another enzyme that may contribute to a better cookie spread is cellulase, which ruptures the linkages between starch and protein molecules allowing cookie dough to spread further. Finally, protease is used to rupture the bond between peptide bonds of proteins and inhibit gluten development improving cookie spreadability and tenderness.

What is the importance of water activity in cookies and should I measure it?

Water activity (aw) is the amount of water available for microbial growth and chemical reactions such as lipid oxidation. It should not be confused with moisture content, which accounts for all the water present in the product. aw is an extremely important parameter for the prediction of the shelf life stability of a product, given that influences microbial growth. Water activity below 0.6 prevents most microbial proliferation, microbes require aw above this limit to grow. Values under 0.2 prevent virtually all microorganism growth. Water activity is also an important factor in lipid oxidation, generally, reduced water activity retards lipid oxidation, however, down to 0.4 value the lipid oxidation reaction rate increases due to the concentration of pro-oxidants and the mobility of reactants within the product.

Controlling water activity in a range between 0.4-0.6 is ideal for keeping microbial stability and retard lipid oxidation reactions. The usage of antioxidant agents, specially clean-label ingredients such as vitamin E is recommended to prevent and retard the deteriorating reactions that can affect product shelf-life.

Cookie	Water Activity	Moisture Content
Commercial Chocolate Chip Cookies	0.647	8.60%
Commercial Sandwich Cookies	0.309	1.40%

Table 8: Water activity and moisture content of commercial cookies
Source: "Water Activity in Snack Foods." AQUALAB, 14 May 2024,. Accessed 26 Jan. 2025.

SUMMARY

Cookies are the world's favorite treat for a reason, they are the perfect mix of indulgence and convenience. Cookies production is characterized by a wide range of possible formulations to satisfy all consumer's needs. However, the same principles are kept in all of the formulation and processing alternatives available for bakers worldwide.

Assuring cookie quality is of extreme importance to avoid losses, and keep consumers happy with your products. Typical challenges presented in today's cookie market are addressed in this pocket guide, ranging from traditional cookies to novel gluten-free formulations for the most health-conscious consumers.

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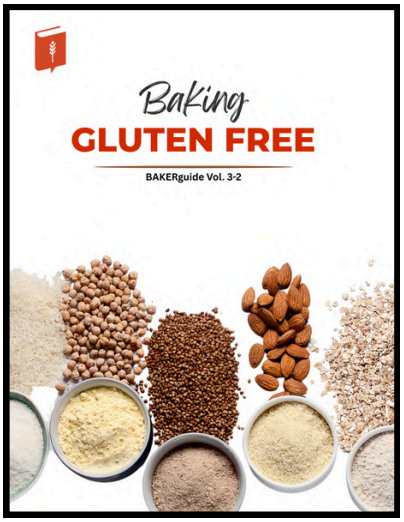

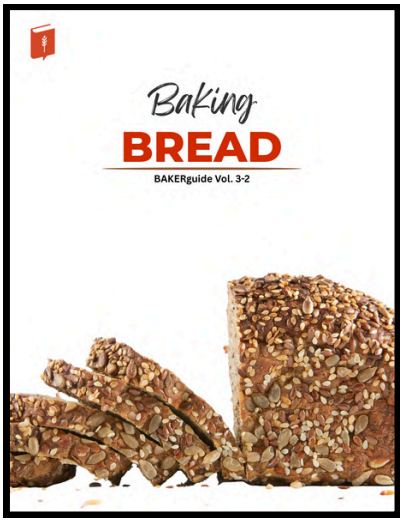

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