



PASTRIES, PIES & HANDHELD SNACKS

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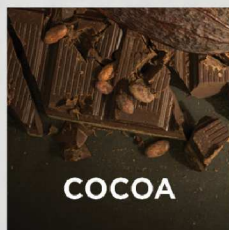


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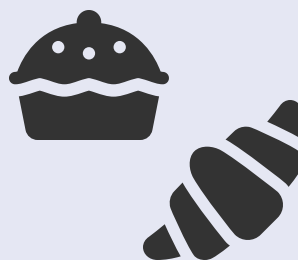
INTRODUCTION

Handheld Snacks is a category that covers a wide variety of products on the supermarket shelves. Oftentimes, they include nutritional bars, granola bars, handheld pies, danishes and even cake bars! You can find them in the snack cakes aisle, or even at the fresh bakery section of your local grocery store. Variety is key in the formulation of these products, and a wide range of options are available to satisfy consumers needs and preferences.

The Pastries and pies market is projected to have a compound annual growth rate (CAGR) of 3.9% for the 2019 - 2029 period. The current growth is being driven by the increasing demand for convenient and delicious food products. However, the market growth is also influenced by novel trends from consumers who are looking for ready to eat products with nutritional benefits associated with the increasing keto and clean label trends.¹



Pastries and Pies Market Opportunities



- ▶ Pastries and Pie market is expected to grow at a compound annual rate (CAGR) of **3.9%** from 2019 to 2029.
- ▶ Novel current trends are surging due to the consumer's interest in healthier baked goods.
- ▶ Consumer surveys indicate that foods labeled "keto-friendly" appeal to those actively trying to limit their sugar and/or total carbohydrate intake.

Cakes, Pastries, & Sweet Pies Market Size & Share Analysis - Industry Research Report - Growth Trends, www.mordorintelligence.com/industry-reports/cakes-pastries-and-sweet-pies-market. Accessed 19 Feb. 2024.



Definition and Types

Pastries

Pastries are a category of baked goods characterized by their intricate layers and delicate textures, often composed of flour, butter, and sugar. These culinary creations undergo a process of lamination, where layers of dough and fat are folded together to create a flaky, airy structure upon baking. Pastries are not only appreciated for their sensory appeal due to their sweet and savory varieties, as well as all of their potential fillings or toppings that increase the available options for all kinds of consumers.²

In the USA, the common pastries on supermarket shelves are croissants, Danishes, cream puffs or profiteroles, eclair, cannoli, and baklava. These are made from the following 5 types of pastry dough:

- Flaky
- Short crust
- Rough Puff
- Choux
- Filo



Pies

Pies are culinary preparations consisting of a pastry crust filled with sweet or savory ingredients, typically enclosed within a sealed shell made from any of the above pastry dough. Its structure provides a protective barrier that prevents moisture loss and ensures even heat distribution during baking. Common fillings include strawberry jam, blueberries, chocolate, pumpkin, and several nuts such as macadamia.²



Handheld Snacks

Handheld snacks encompass a diverse array of portable food items designed to provide convenient sustenance for individuals on the go. These snacks come in various forms, including bars, bites, and rolls, each offering a unique combination of flavors and textures to tantalize the taste buds. Comprising ingredients such as grains, nuts, seeds, dried fruits, and sweeteners. Among the most commonly consumed are bars, muffins, brownies, donuts, cereal bars or granola bars.³



INGREDIENTS

Depending on the baked goods, some of the following ingredients may or may not be required to produce pastries, pies or handheld snacks.

Flour

Flour serves as the backbone of pies, pastries, and handheld snacks, providing the structure and texture necessary for their creation. It contains gluten, a protein that, when hydrated and kneaded, forms a network that gives dough its elasticity and strength. In pies and pastries, flour creates a sturdy base for fillings and toppings, while in handheld snacks, it contributes to the dough's consistency and ability to hold together various ingredients. Pastry or all purpose flour with a protein content of around 10% is acceptable for the production of pastries, higher protein content may cause the pastry to be tough. Strong flours can be mixed with around 30% of pastry flour to improve their extensibility during lamination. It is important to consider that during lamination, the gluten formed should be strong enough to entrap the water vapor produced during baking.^{2,4}



Water

Water is a crucial ingredient in baking, serving as a hydration agent that binds the other ingredients together and facilitates gluten development. In pies and pastries, water helps create a cohesive dough that can be rolled out and shaped, while in handheld snacks, it ensures the proper consistency of batters and doughs. Additionally, water contributes to the texture and tenderness of the final product, playing a key role in achieving the desired mouthfeel. It should be noted that excess water hydrates the proteins in the flour, developing them further and creating a more elastic network.^{2,4}

In pies, cold water is usually added to prevent fat melting too quickly that could have a negative effect on the final flaky texture desired in these baked goods. Cold water also inhibits gluten development and thus prevents the toughness of the final product.^{2,4}



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Fat

Fat, often in the form of butter or shortening, adds richness, flavor, and texture to pies, pastries, and handheld snacks. In pie crusts and pastry doughs, fat coats the flour particles, inhibiting gluten formation and creating a tender, flaky texture. It also provides moistness and enhances the flavor profile of the finished product. In handheld snacks, fat contributes to the mouthfeel and helps bind ingredients together, resulting in a satisfying eating experience. 2,4

Pastry shortenings are formulated for pastries; these shortenings exhibit a plastic or semi-solid consistency with a distinct polymorphic structure (β' crystals) across a wide temperature spectrum under standard processing conditions. These attributes play a crucial role in achieving optimal puffiness during baking and imparting a delicate, flaky texture to the final products.

Roll-in shortenings typically boast elevated levels of tri-saturated and tri-unsaturated triacylglycerols, along with high Solid Fat Index (SFI). Bakers commonly assess the appropriateness of a shortening through tactile evaluation using the "thumb and finger" method, as well as visually inspecting its deformability. Essential physical parameters for effective pastry shortening functionality encompass increased solid fat content and melting points, β' polymorphic structure, and elevated yield values within specific temperature thresholds.



Sugar

Sugar is not only a sweetening agent but also a key ingredient in the development of pies, pastries, and handheld snacks. In pie fillings and pastry doughs, sugar adds sweetness and helps balance the flavors of other ingredients. It also contributes to browning and caramelization during baking, enhancing the visual appeal and complexity of flavor, and acts as a water retention agent regulating the degree of gluten development. In pie fillings, it helps retain moisture, lower water activity and prevents microbial deterioration. In handheld snacks, sugar provides sweetness and acts as a preservative by reducing water activity, extending the shelf life of the product while enhancing its taste. Finally, in yeast leavened doughs such as Danish pastry, sugar acts as food for yeast growth. 2,4



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Yeast

Yeast is a leavening agent commonly used in the production of pastries but not in pies. In pastries such as croissants, yeast interacts with flour and water to produce carbon dioxide gas, which creates air pockets in the dough, resulting in a light, airy texture. This fermentation process also contributes to the development of complex flavors and aromas in the final product, making yeast an essential ingredient in certain types of pastries.^{2,4}



Eggs

Eggs are versatile ingredients that play multiple roles in the creation of pies, pastries, and handheld snacks. In pie fillings and pastry doughs, eggs provide structure, moisture, and richness, helping bind the ingredients together and adding depth of flavor. In handheld snacks, eggs act as a binding agent, holding together ingredients like grains, nuts, and dried fruits. They also contribute to the nutritional profile of the product, providing essential proteins and fats.^{2,4}



Nuts

Nuts are versatile ingredients that add texture, flavor, and nutritional value to pies, pastries, and handheld snacks. In pies and pastries, nuts are often incorporated into fillings or used as toppings, providing a crunchy contrast to the soft texture of the dough or filling. Whether it's the buttery richness of pecans in a classic pecan pie or the earthy crunch of almonds atop a flaky croissant, nuts bring a satisfying depth of flavor to baked goods. In handheld snacks, nuts offer a convenient source of protein, healthy fats, and essential nutrients, making them a popular choice for energy bars, granola mixes, and trail mixes. Additionally, nuts lend a satisfying crunch and hearty texture to snacks, enhancing their overall sensory appeal.^{2,4}



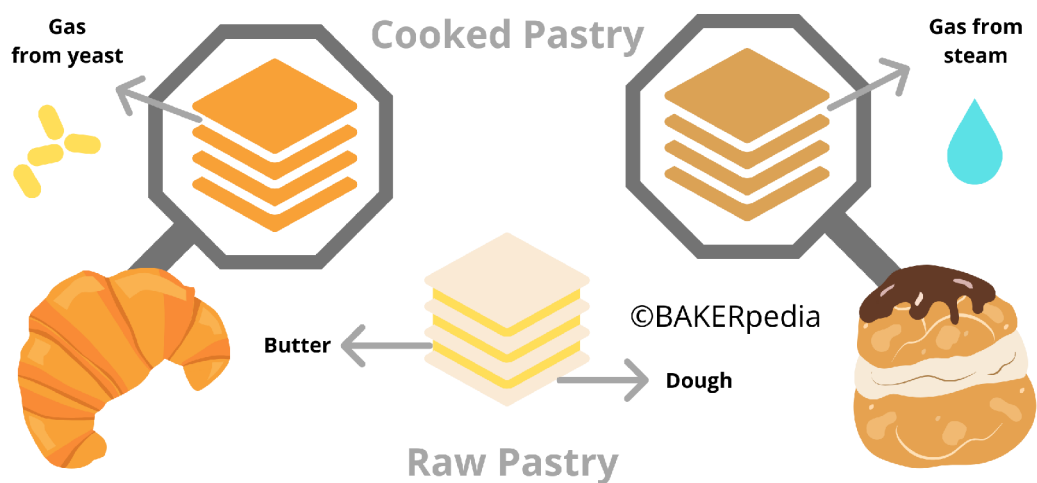
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PROCESSING

Pastries

Pastries are laminated products that require a significant amount of fat to produce the desired flaky texture. Puff pastry does not require any leavening either chemical or biological, its volume solely depends on the water vapor release during baking. While other pastries such as croissants and Danish pastry do require the biological activity of yeast to produce the desired texture. 2,4

Croissant vs Puff Pastry



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A general guideline for processing pastries is accomplished by the following steps:

- 1. Dough Mixing:** the first step involves combining flour, water, fat, sugar, and other ingredients to form a cohesive dough, ensuring proper hydration or gluten development for optimal texture.
- 2. Dividing of the Dough:** Once mixed, the dough is portioned into uniform pieces or sheets, a crucial step in ensuring consistency and efficiency, especially in automated production environments.
- 3. Laminating:** layers of dough and fat are folded together through a process of rolling and folding, creating the characteristic flakiness and layering in pastries like croissants and puff pastry.
- 4. Make-up:** this step involves shaping the laminated dough into its final form, whether it's croissants, turnovers, or other pastry shapes, each requiring precise techniques for a uniform appearance.
- 5. Filling and/or Decoration:** before or after proofing, pastries may be filled with sweet or savory fillings and adorned with decorative toppings, enhancing both flavor and visual appeal.

6. Cooling: after baking, pastries are cooled on racks to allow excess heat to dissipate, ensuring they reach the desired texture and preventing moisture buildup.

7. Icing: pastries may be adorned with icing or glaze for a finishing touch, adding sweetness and shine to tempt the taste buds.

Pies

1. Dough Preparation: The process begins by preparing the pie dough, which typically involves combining flour, fat (such as butter or shortening), salt, and cold water. The ingredients are mixed until a cohesive dough forms.

2. Chilling: Once mixed, the dough is chilled to allow the fat to solidify and the gluten to relax, making it easier to roll out and preventing shrinkage during baking.

3. Rolling: The chilled dough is rolled out into a thin, even sheet using a sheeter. This step ensures that the crust will be uniform in thickness and size.

4. Lining: The rolled-out dough is carefully placed into a pie pan, trimmed to fit, and crimped along the edges to create a decorative border.

5. Filling: The prepared filling, whether sweet or savory, is added to the pie crust. This can include fruits, custards, meats, vegetables, or other ingredients depending on the type of pie being made.

6. Top Crust (Optional): For pies with a double crust, such as fruit pies, a second layer of dough is rolled out and placed over the filling. The edges are sealed and vented to allow steam to escape during baking.

7. Egg Wash (Optional): An egg wash, made by whisking together egg and water, may be brushed over the crust to promote browning and give the pie a glossy finish.

8. Baking: The assembled pie is baked in a preheated oven until the crust is golden brown and the filling is bubbling and cooked through. Baking times and temperatures vary depending on the type of pie.

9. Cooling and Setting: After baking, the pie is allowed to cool on a wire rack to set the filling and firm up the crust before slicing and serving. This step ensures that the pie holds its shape when cut.



Bars

- 1. Ingredient Mixing:** The process begins by mixing together the main ingredients, which typically include grains (such as oats or granola), nuts, seeds, sweeteners (like honey or syrup), and binding agents (such as nut butter or eggs).
- 2. Uniform Distribution:** The mixed ingredients are evenly distributed to ensure that each bar contains a balanced combination of flavors and nutrients.
- 3. Pressing into a Mold:** The mixture is pressed firmly into a mold or pan lined with parchment paper, ensuring that it is compacted tightly to hold its shape when cut into bars later.
- 4. Leveling and Smoothing:** Once pressed, the surface of the mixture is leveled and smoothed using a spatula or the back of a spoon to create an even layer.
- 5. Chilling or Baking (Optional):** Depending on the recipe, the bars may be chilled in the refrigerator to firm up or baked in the oven to further set the ingredients and develop flavor. If the bars are to be baked, they are placed in a preheated oven at the specified temperature and baked for the recommended time until they are golden brown and set.



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Snack Pockets

- 1. Dough Mixing:** This starts with combining flour, fat (such as butter or shortening), salt, flavors and cold water. The ingredients are mixed until a cohesive dough forms.
- 2. Ingredient Mixing:** The fillings for snack pockets can either be sweet or savory. This is usually mixed in a separate mixer and kept in the walk in refrigerator until it is used. Most fillings are made with temperature-resistant starches, and a low moisture content to prevent boil out during the baking process.
- 3. Filling process:** Depositors can be used in this process where the filling is deposited onto pastry dough that is folded and cut in a continuous process. Or it can be co-extruded into the center of a continuous dough and cut.
- 4. Proofing:** This allows the dough to rise, double the size of the pockets, develops the flavor and creates a light, airy texture before baking.
- 5. Baking:** An internal kill step needs to be established without boiling out the filling of the product. This processing step should produce a golden brown color.
- 6. Glazing:** An glaze or frosting can be applied after the baking process for sweet goods.
- 7. Cooling:** Spiral conveyor or vacuum cooling can be used to cool the products before packaging.
- 8. Frozen products:** After the cooling process, individual pockets should be frozen in the blast freezer. This would ensure the center of the product reaches 32oF before it is packaged and boxed.

PRODUCT DEVELOPMENT

Pastries

Several common formulations for pastries, pies and handheld snacks are shown in the following section:

Danish Pastry

Ingredient	%Bakers	%Total
Flour	100	50
Water	30	15
Whole Eggs	10	5
Milk	10	5
Yeast	5	2
Sugar	4	2
Salt	2	1
Roll - in fat	40	20
Total	201	100

Table 1. Danish Pastry Formulation



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Puff Pastry

Ingredient	%Bakers	%Total
Flour	100	43.5
Water	50	23.5
Salt	1	0.4
Roll - in fat	75	32.6
Total	226	100

Table 2. Puff Pastry Formulation

Novel alternatives for traditional fillings have been developed worldwide. Some of the most novel and promising alternatives are the usage of chia powder to improve the viscosity of fillings and jams as a clean label and low sugar alternative with a dosage of 2-10% depending on the total solid of the formulation and the desired viscosity to achieve.



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Pies

Pumpkin Pie

Ingredient	%Total
Butter	16.1
Flour	17.0
Honey	1.5
Salt	0.1
Vanilla	0.3
Milk	2.2
Filling	
Pumpkin (Can)	30.1
Sugar	6.4
Salt	0.2
Egg	8.1
Evaporated Milk	17.8
Cinnamon	0.1
Ginger	0.1
Nutmeg	0.1
Total	100

Table 3. Pumpkin Pie Formulation



Key Lime Pie

Ingredient	%Total
Graham Cracker	22.84
Butter	1.90
Sugar	3.81
Filling	
Condensed Milk	50.13
Lime Juice	16.24
Egg Yolk	5.08
Total	100.00

Table 4. Key Lime Pie Formulation



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Handheld Snacks

Handheld snacks covers a wide variety of product, most of the following formulations are focused in nutritional bars⁷

Breakfast Bar

Ingredient	%Total
Applesauce	15.26
Eggs	9.51
Honey	7.09
Butter	4.75
Brown Sugar	4.59
Salt	0.25
Vanilla	0.35
Baking Soda	0.50
Chia Flour	5.28
Quinoa Flour	3.45
Oats	19.51
Raisins	16.68
Flaxseed	2.81
Pumpkin Seeds	4.96
Almonds	5.00
Total	100.00

Table 5. Breakfast Bar Formulation

Novel inclusions in bars that can be used to improve the nutritional profile of the products can be:

1. Chia Flour:

Addition of chia flour of around 20% of total weight provides a high fiber and omega-3 content for bars, higher amounts may present higher toughness that can be held by the machinery required for production such as the Buhler double extrusion. Usage of chia flakes in combination with vegetable proteins such as soy and pea protein show promising results.



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2. Peanut Butter Nutrition Bar:

Addition of peanut butter can improve flavor and munching texture as well as the nutritional profile of the bar.

3. Keto Cluster:

A mixture of water, malt and chia powder can help increase the viscosity of the syrup used for binding on ingredients in nutritional bars.



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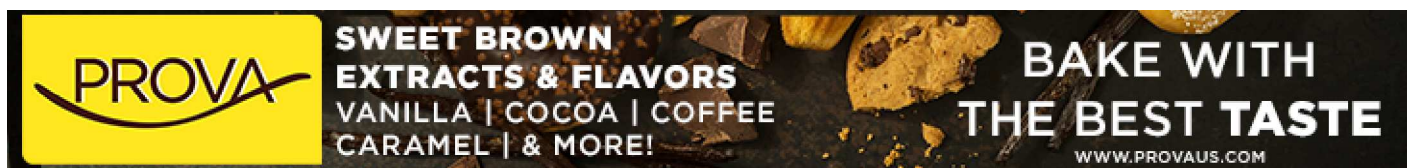
SUMMARY

Recent pastries, pies and handheld snacks trends have been developed due to the need of consumers for healthier and novel alternatives for traditional options available of these products. This has caused a significant increase in the formulation of keto, clean label products with the substitution of traditional wheat flour. Substitution of wheat flour in pastries, pies and handheld snacks has a significant impact on the final product due to the importance of flour in this formulations. However, recent advances in research and development have resulted in products with similar organoleptic characteristics to the original product with better nutritional profiles.

These newer trends represent both challenges and opportunities for current and future bakers around the world in their quest to provide flavorful, healthier and pleasing baked products for their consumers.

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