

Unlocking the Secrets of Food Science



Mardi Gras Edition

King Cake Tradition

The King cake tradition in Louisiana is a cherished part of the Mardi Gras celebrations. This pastry, shaped like a wreath and flavored with cinnamon, is adorned with colorful sugars in purple, green, and gold, symbolizing justice, faith, and power. A unique aspect of the King cake is the inclusion of a small plastic baby hidden inside. The individual who finds the baby in their slice is believed to have good luck and is often expected to host the next gathering. King cakes are enjoyed from January 6th (King's Day) through Mardi Gras, fostering a sense of community and festivity throughout the season.

What, Exactly, Is Fermentation?

Yeasts are a group of fungi – one in particular is the star of baking leavened breads: *Saccharomyces cerevisiae*. Yeasts break down sugar for energy and make carbon dioxide and alcohol in the process. With breads, these two by-products are trapped in the dough matrix, but are released during baking.

The period of time where the dough is set aside to allow the yeast to produce carbon dioxide is called fermentation. The carbon dioxide slowly inflates the dough while stretching the gluten network, which helps to make a more workable dough. In general, fermentation is complete when the dough doubles in size. Loaves are then formed and given time to do another rise, which is generally referred to as proofing.

Gluten: What It Is and How It Forms?

Gluten is a protein found in wheat, barley, and rye. It's composed of two main proteins: glutenin and gliadin. When

flour is mixed with water, these proteins combine to form gluten. Here's how it works:

- 1. Mixing Flour and Water:** When you mix flour with water, the glutenin and gliadin proteins in the flour absorb the water and start to interact.
- 2. Kneading:** As you knead the dough, these proteins form a network of long, stretchy strands. This network gives the dough its elasticity and strength.
- 3. Trapping Gas:** During fermentation, yeast produces carbon dioxide gas. The gluten network traps these gas bubbles, causing the dough to rise and giving bread its airy structure.

This process is what makes bread dough stretchy and able to rise, resulting in the chewy texture of baked goods like bread and pizza crust.

Golden, Brown, Delicious – The Maillard Reaction

The Maillard reaction is what happens when proteins and sugars in food react under heat, creating that delicious browning and flavor we love in things like seared steaks, toasted bread, and roasted coffee. It's named after a French chemist, Louis-Camille Maillard, who discovered it in 1912.

This reaction usually kicks in at temperatures between 280°F and 330°F (140°C to 165°C). The Maillard reaction is what makes food taste amazing and look appetizing, but if you overdo it, you can end up with burnt flavors.

Flavors produced by the Maillard Reaction: Savory, floral, onion, meaty, green vegetable, chocolate, potato, earthy.

What About Caramelization?

The Maillard Reaction is different from the term caramelization. In some ways, it is similar because it also gives the characteristic color and aroma to baked goods and roasted meats, but it occurs without proteins. It requires higher temperatures – it starts at 330°F (165°C) and above! It also generates different flavors because it makes different compounds which contribute to many of the characteristics of candies and other treats.

Flavors produced by caramelization: Sweet, sour, bitter, fruity, sherry-like, butterscotch, caramel, nutty.

Sugar Crystallization

Sugar crystallization is the process where sugar molecules arrange themselves into a solid, orderly structure, forming crystals. Here's a simple breakdown:

1. **Dissolving Sugar:** When you dissolve sugar in water, the sugar molecules separate and spread out within the water.
2. **Saturation:** If you keep adding sugar, eventually the solution becomes saturated, meaning it can't dissolve anymore sugar.
3. **Cooling:** As the solution cools, the sugar molecules start to come back together and form crystals. This happens because the water can't hold as much dissolved sugar at lower temperatures.
4. **Crystallization:** The sugar molecules arrange themselves into a repeating pattern, creating solid crystals.

This process is used in making hard candies, fudges, and other sweet treats. Controlling the crystallization process is key to getting the right texture in these foods. Cooks can make different textures from the same materials, just by controlling the ratio of sugar to water, the temperature, how quickly it cools, and how much it is stirred. Candies like pralines and fudge have lots of fine crystals.

In the case of our king cake glaze, the goal is to avoid large sugar crystals from forming in the glaze. The addition of butter and corn syrup helps to prevent these coarse crystals, creating a smooth texture in the finished product.

Sources:

1. *Food Science*, by Norman Potter & Joseph Hotchkiss
2. *On Food and Cooking: The Science and Lore of the Kitchen* by Harold McGee
3. *The Science of Food Cooking, Cook's Illustrated*
4. *The Tradition Behind the Mardi Gras King Cake*, Southern Living
5. *The History and Meaning of the Mardi Gras King Cake*, Reader's Digest
6. *Understanding Food Science and Technology*, by Peter Murano



April 25th "Chips and salsa workshop"

Join us at the LSU AgCenter Test Kitchen! Explore delicious recipes and discover the science behind the art of cooking.

When: Friday evenings from 5:00 pm to 8:30 pm

Dates:

- February 28 - King Cake
- **April 25 – Chips and Salsa**
- June 27- Ice Cream Cake
- August 22
- October 17
- December 12

Cost: Varies by event

Location: LSU AgCenter Test Kitchen, 39 Forestry Ln., Animal and Food Sciences Laboratories, Baton Rouge, LA.

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