

Basic, Moist, Sweet Cake

By Shirley Corriher

Adapted for CHM 182: Kitchen Chemistry by Keri Colabroy

Cookwise reading: pg. 135-144, 146-147

Kitchen equipment

Medium and Large mixing bowl	Countertop Convection Oven, with one rack
Liquid measuring cup	Hot gloves/oven mitts
Dry measuring cups	Parchment paper and wax paper (not the same thing)
Measuring spoons	Rubber scraper/spoonula
Electric Hand mixer with wisk attachments	"cooling rack" (i.e. the broiler rack from the convection oven – it has feet that let it stand off the countertop)
9 x 2 inch round cake pan	
Wire mesh strainer	Ice from second floor of Trumbower

Special Instructions

1. Choose what *version* cake you will make (version 1 or 2). The class must be evenly split in half.
2. Make a list on the board of who is doing what version.

The two cake recipes are designed to use the same set of ingredients to produce two different cakes (shown below). In any cake, we want air cells for texture and volume, and we want limited gluten development for tenderness, texture and volume.

Version I (pg. 143 in Cookwise)	Version II (pg. 146 in Cookwise)
Tall and light cake (Creaming method)	Tender and moist cake (pastry blend method)
The sugar and butter are creamed together to incorporate air bubbles into the fat for maximum cake volume. The butter creaming is the critical step. The butter must not get too warm and start to melt (this is not a problem with shortening which melts at a higher temperature).	Flour and other dry ingredients are blended with all of the fat before the eggs and other liquid ingredients are added. This coats the starch granules in the flour with fat (and therefore limits access of water to the glutenin and gliadin - since water and fat do not mix) and limits gluten formation.
Remaining ingredients are added in turn, beating with each step to get maximum volume.	Standard mixing times achieve adequate aeration. Baking powder enlarges bubbles already present in the batter
Baking powder enlarges bubbles already present in the batter	Cake is fall apart tender from minimal gluten formation, but not as tall and light as with the creaming method.
Cake is tall, with a light, velvety texture from many evenly distributed air cells and a little more gluten.	

Ingredients for Cake version 1

Makes one 9 x2 inch round cake. This is considered a “high ratio” or “sweet” cake recipe because the weight of the sugar is equal to or greater than the weight of the flour, and extra emulsifiers are added. One cup of sugar is ~200g, while one cup of cake flour is ~130g. This recipe also calls for egg yolks for their emulsifying properties.

1 ½ cups sugar	½ cup buttermilk at room temperature (65°F)
Non-stick cooking spray <i>with</i> flour	1 teaspoon pure vanilla extract
Parchment paper	¼ lb (1 stick) unsalted butter at room temp (65°F)
1 ½ cups cake flour	2 large eggs at room temperature (65°F)
1 ½ teaspoons baking powder	3 large egg yolks at room temperature (65°F)
½ teaspoon salt	⅓ cup vegetable oil
Wax paper	Wooden toothpick
Digital thermometer	Ruler and scissors

Instructions for Cake: Version 1

1. Preparation:
 - a. Place your large mixing bowl and beaters in the freezer for 20 minutes (use the freezer in 228). Do this first, so you can set up everything else while waiting.
 - b. Ensure the butter, eggs and buttermilk are out at room temperature.
 - c. Place a rack in the lowest position in the oven and preheat the oven to 325°F. It is important that the temperature be constant (read pg. 150 in Cookwise to see why)
 - d. Grease your cake pan by spraying it with the non-stick cooking spray *with* flour. Cut out a 9 inch circle of parchment paper and place it in the bottom of the pan, then lightly spray it with the non-stick cooking spray *with* flour.
2. Measuring:
 - a. Measure out the flour (stir, scoop, sweep!), baking powder and salt into your medium mixing bowl – stir briefly with a spoon to mix. Cover your cutting board with a piece of wax paper (not the same as parchment paper). Using your wire mesh strainer, sift the dry ingredients onto the wax paper. Return the sifted ingredients to the medium mixing bowl. Sift once more through the wire mesh strainer onto the wax paper (two total siftings).
 - b. Measure out the room temperature buttermilk into your liquid measuring cup. Add the vanilla to the butter milk.
3. Ensure the butter is at or near 65°F, and retrieve the mixing bowl and beaters from the freezer. Put some ice and water in your medium mixing bowl (you will not be consuming this ice – it is simply for cooling purposes – so you may get the ice from the second floor).
4. *Creaming the butter is the most important step for introducing volume – you are literally beating air into the solid fat. Since butter melts between 67-68°F – the butter can start melting just from the heat of the beating for a*

long time. We have tried to minimize this by chilling the bowl and beaters, but you should also periodically check the temperature of the creamed butter with your thermometer. If the temp gets much above 68°F, then briefly cool the bowl and butter by scraping the contents to the bottom and placing the bowl in an ice-water bath – once cooled to 65°F, resume creaming. This problem could, of course, be completely avoided by using vegetable shortening....but that doesn't taste quite as good ☺

Cream the butter with the electric mixer on medium speed until light in color (about 5-6 minutes) by moving the beaters around the bowl and periodically scraping down the sides of the bowl with the rubber spoonula. After 5-6 minutes have passed, add the sugar in a slow, steady stream with the mixer running. Continue beating the butter-sugar mixture for 5-6 minutes (move the beaters around the bowl and periodically scrape down the sides. Add the eggs and yolks one at a time, beating for 45 seconds after each addition. Continue to beat the mixture until it is light and air looking (an additional 2-3 minutes)

5. Remove the electric mixer, and stir in the oil using a spoonula. Fold in half the sifted flour mixture using your rubber spoonula. Scrape down the sides of the bowl, then fold in half of the buttermilk-vanilla mixture. Fold in the remaining sifted flour mixture and scrape down, then the remaining buttermilk-vanilla mixture.

“Folding” is the process of blending a light ingredient, such as creamed butter, into a heavier ingredient by lifting from underneath with a spatula or spoon.. A motion commonly used to fold the ingredients involves starting at one side of the bowl, moving downward and then across the bottom to the opposite side, enabling the ingredients on top to be brought down into and replacing the ingredients on the bottom. The bowl is then rotated a quarter turn and the motion is repeated. It is important not to completely blend the ingredients together or the lighter ingredient will lose volume.

6. Pour the batter into the prepared pan. Smooth the batter with the rubber spoonula, leaving the edges a breadth higher than the center. Bake until a toothpick inserted 1-inch deep into the center comes out clean, about 30-35 minutes. The sides should just begin to pull away from the sides of the pan when you place the cake on the rack to cool.
7. Let the cake cool on the cooling rack for 10-20 minutes. Tap the sides of the pan on the counter to loosen the cake. Spray a second rack lightly with non-stick cooking spray and invert the cake onto it. Peel off the parchment liner, then replace the liner on the cake with the sticky side up/out. Invert the cake back onto the original cooling rack so the cake is now right side up. Cool completely before icing. Work with a group that made Cake version 2 – they will make the icing and share ½ with you.
8. Before icing, measure the height of your cake with a ruler.

Ingredients for Cake version 2

Makes one 9 x 2 inch round cake. This is considered a “high ratio” or “sweet” cake recipe because the weight of the sugar is equal to or greater than the weight of the flour, and extra emulsifiers are added. One cup of sugar is ~200g, while one cup of cake flour is ~130g. This recipe also calls for egg yolks for their emulsifying properties.

1 ⅓ cups sugar	6 tbsp and 2 tbsps buttermilk (½ cup total) at room temperature
Non-stick cooking spray <i>with flour</i>	1 teaspoon pure vanilla extract
Parchment paper	¼ lb (1 stick) unsalted butter softened
1 ½ cups cake flour	2 large eggs at room temperature (65°F)
1 ½ teaspoons baking powder	3 large egg yolks at room temperature (65°F)
½ teaspoon salt	⅓ cup vegetable oil
Wax paper	Wooden toothpick
Digital thermometer	Ruler and scissors

Instructions for Version 2

1. Preparation:
 - a. Ensure the butter, eggs and buttermilk are out at room temperature. Make sure the sour cream is out and at room temperature as well...but that is for the frosting, not the cake.
 - b. Place a rack in the lowest position in the oven and preheat the oven to 325°F. It is important that the temperature be constant (read pg. 150 in Cookwise to see why)
 - c. Grease your cake pan by spraying it with the non-stick cooking spray *with flour*. Cut out a 9 inch circle of parchment paper and place it in the bottom of the pan, then lightly spray it with the non-stick cooking spray *with flour*.
2. Measuring:
 - a. Stir the eggs, yolks, 6 tablespoons of the buttermilk and the vanilla together in a medium bowl, then pour into your liquid measuring cup.
 - b. Measure out the flour (stir, scoop, sweep!), sugar, baking powder and salt into your large mixing bowl and mix with the electric mixer for 30 seconds on the lowest speed.
3. Ensure the butter is softened (65-70°F), then add the butter, the oil and 2 tbsp of the buttermilk to the dry ingredients. Mix on low speed to moisten the dry ingredients, then increase to medium speed and beat for 3-4 minutes by moving the beaters around the bowl and periodically scraping down the sides with the rubber spoonula. Add a third of the egg-buttermilk mixture to the dry ingredients and beat for 30 seconds (scraping down the sides of the bowl). Repeat until all the egg-buttermilk mixture is added (scraping with each addition).
4. Pour the batter into the prepared pan and bake for 30-35 minutes or until a toothpick inserted 1 inch deep into the center comes out clean and the cake springs back when lightly pressed in the center. The cake will not pull away from the sides of the pan until after it is out of the oven

5. Let the cake cool on the cooling rack for 10 minutes. Tap the sides of the pan on the counter to loosen the cake. Spray a second rack lightly with non-stick cooking spray and invert the cake onto it. Peel off the parchment liner, and then replace the liner on the cake with the sticky side up/out. Invert the cake back onto the original cooling rack so the cake is now right side up. Cool completely before icing.
6. Once cool and before icing, measure the height of your cake with a ruler.
7. *If you made cake version 2 – your procedure was a little shorter. Please proceed to make a batch of chocolate icing (instructions below) and share half of it with a group that made cake version 1. We need 4 total groups to make the chocolate frosting.*

Chocolate Icing

(from Shirley Corriher's Bakewise)

You can adjust proportions of milk and semi-sweet chocolates depending on the sweetness you desire.

<i>Kitchen Equipment</i>	
Liquid measuring cup	Microwave
Medium and large mixing bowls	Electric mixer with beaters
Whisk	Rubber spoonula

<i>Ingredients</i>
12 ounces (1 bag) milk chocolate, chips or chopped
9 ounces (~75% of a bag) semi-sweet chocolate, chips or chopped
2 tablespoons light brown sugar
½ teaspoon salt
1 teaspoon pure vanilla extract
3 tablespoons light corn syrup
1 ½ cups room temperature sour cream – measure in your liquid measuring cup

Place the chocolate in your medium mixing bowl and microwave on 50% power for 30 second intervals, stopping to stir thoroughly after every interval, until smooth. Those last bits of chocolate melt by stirring, not by heating. Do not overheat, and do not heat for more than 30 seconds at a time or chocolate will burn.

In your large mixing bowl, use your green whisk to whisk together the brown sugar, salt, vanilla and corn syrup. Stir in the sour cream until nearly smooth. When the melted chocolate has cooled slightly – but is still liquidy - pour out slowly (scraping bowl with rubber spoonula) into the sour cream and sugar mixture while beating with the electric hand mixer on low speed. Beat on low speed until very smooth—it will get stiffer as you go, so beat just until you have achieved a spreadable consistency. Don't overbeat. Share ½ the icing with a group that made Cake version 1.

Analysis

Before analysis you should have cleaned up your work area, washed and put away all materials and equipment.

It will speed analysis if you find another group to collaborate with that made a cake version different than yours.

1. Record the height of your cake, and the height of the “other version” cake. Which one was taller? Is this what you expected, why or why not?
2. After the cakes are iced, cut into your cake and compare the crumb and texture with a slice of the “other version”. Which cake appears moister (more tender)? Is this what you expected, why or why not?
3. Split a piece with the other group so you can taste both “versions” of the cake. Describe how each cake is different in texture and mouth-feel – connect those observations to your understanding of the methods used to make each cake (maximum aeration vs. minimal gluten)
4. Did anything about your cake not turn out quite as expected? What do you think you could have done to fix the problem.

Please answer these questions, by number, in type-written report. I should be able to clearly find your answers to each question. Although I ask you to include your observations, your scientific evaluation of those observations is what is most important when writing the report.

Please turn in your reports to the link on Blackboard by Monday, 3/12 (Monday after spring break)