

How different flours affect the textures in cookies

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What will happen when different amounts of gluten are in cookies?

Hypothesis - If I use 4 different types of flour (Bread, Cake, All purpose, and Almond flour) to make cookies, then I expect...

- Bread flour- A chewy cookie because bread doesn't have much air in it which leads to a chewy texture
- Cake flour- A moist and soft cookie because cakes are moist and have many air bubbles in them, so the cookies will have a lot of air bubbles too
- All purpose flour- A crunchy cookie because AP flour is sometimes used in pie crusts, pie crust are crunchy and flaky
- Almond flour- A chewy cookie because Almond flour is used for a specific cookie to make it chewier than most cookies

Procedure

1. Gather new bags of various flour types (all purpose, cake, bread, and almond flour)
2. Use the same recipe for each cookie batch
3. And use a different flours in each batch
4. Repeat the same process for each batch of cookies
5. Make each cookie the same size
6. Bake the cookies at the same temperature, on the same cookie sheet, in the same oven
7. When the cookies come out of the oven, let them cool off for five minutes before removing them from the pan
8. Look at how much the cookies spreaded out in the oven
9. Cut the cookies in half when they are fully cooled off
10. Write down how hard or easy it was to cut the cookies in half
11. Look closely at the cookies to see how much air bubbles are in the cookies, or to see how soft or hard the cookies are
12. Collect all of your data from the cookies

Materials

- Flour (Bread, Cake, Almond, All purpose flour)
- Vanilla extract
- Granulated sugar
- Brown sugar
- Kosher salt
- Unsalted butter
- Baking Soda
- Cookie sheets/pans
- An oven
- Stand mixer
- Chocolate chips
- Cooling racks
- Oven mitts

How does the gluten in flour, affect cookies?

Gluten - Gluten acts like a binder, it adds a “stretchy” texture. Since there is no yeast in cookies, gluten has another purpose, it helps the dough hold water. The fat and sugar in cookies is what makes them spread out in the oven. Gluten forms a matrix in cookie, which prevents the cookie to not spread out as much in the oven.

How much gluten is in flour?

- All Purpose flour - 8-11 %
- Cake flour - 7-9 %
- Bread flour - 12-14 %
- Almond flour - 0 %



Research

- All Purpose flour - All Purpose flour is made from wheat. All purpose flour contains a mixture of hard wheat (with more gluten) and soft wheat. This flour contains 10-12 % of protein
- Bread flour - Type of white milled flour from hard red spring wheat grains. Bread flour has a higher protein content than any other flour. More protein equals more gluten.
- Cake flour - cake flour is a light, finely milled flour with a lower protein content than all purpose flour. Cake flour is milled with soft wheat
- Almond flour - Made from ground blanched almonds. Boiled almonds to remove the skin on the almonds, then grinded up and sifted into a flour like consistency.

Bread flour

This flour made a very chewy cookie. It's was very easy to cut. I probably would have baked this batch a little longer to get a better result. These cookies almost touched each other while baking. All of the batches of the cookies were relatively the same size except for the almond flour. This cookie was 4 $\frac{3}{4}$ by 4 $\frac{1}{2}$ inches.



Cake flour

This cookie didn't spread out as much as the others. It was very easy to cut. This was a very dense cookie. The cookie batter wasn't super soft. Warmer or softer cookies tend to spread out more in the oven. This cookie was about $3\frac{1}{2}$ by $3\frac{3}{4}$ inches.



All purpose flour

This was the most crunchy cookie out of all the batches. It didn't spread out a whole lot. This cookie was 3 by 3 ¼ inches. This cookie was the smallest out of all of the batches. It wasn't hard to cut, but it was the cake and bread flour cookies were easier to cut through.



Almond flour

This cookie turned out very thin, it was very difficult to take off the pan. The middle was very soft but the edges were crisp. This flour has no gluten in it, which it had nothing to hold all the fat together. Which is why it spread out a lot and was very flat. Before the cookies went in the oven, the dough was more wet than all the others. This cookie was 5 by 4 1/2.



Table

	All Purpose	Bread	Cake	Almond
Size (in inches)	3 by 3 ¼	4 ¾ by 4 ½	3 ½ by 3 ¾	5 by 4 ½
Texture	Crunchy edges, soft and chewy middle	Whole cookie was chewy	Dense	Edges were crisp, middle was very soft and thin
Texture before baked	Stiff, held together	Stiff, held together	Soft dough, hard to scoop	Soft, a little grainy
Easy to cut	Edges were hard, the middle was easy to cut through	Whole thing was easy to cut	Cut right through	The edges were really hard, middle was easy

Reflection

Half of my guesses of how these cookies would turn out were correct. And the other half were wrong. I found out a lot of good information on these different types of flour. Almond flour is basically just finely ground up almonds. According to <https://www.sciencenewsforstudents.org/blog/eureka-lab/cookie-science-13-deal-gluten> almonds can't soak up all the fat in cookies to hold everything together because it has no gluten in it. Which explains why the almond flour cookie spread out so much.

For next time

If I were to use this same recipe again to make cookies, I would probably use bread flour to make the cookie more chewy. I might experiment with the butter in cookies next just for fun. After I'm all done with that then I'll know how to make my kind of perfect cookie.

Citations

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