

# French Macarons

Ella Brown

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French macarons are a wonderful treat that are great to bring to any event. They are dainty, vibrant and are commonly very tempting. Macarons can greatly differ from one another based on the filling, flavouring and the recipe itself. With precise measurements and process, it's possible to make a delicious macaron that's fluffy, chewy, a firm shell and an airy foot at the bottom of each cookie. In order to create structured and chewy macarons I followed the simple recipe below, it is important to follow the instructions and measurements very precisely in order to create a macaron that has a stable structure but a soft inside.

## **Ingredients:**

### **FOR THE SHELLS-**

- 80 grams extra fine almond flour
- 85 grams powdered sugar
- 2 large egg whites (about 60-64 grams), room temperature
- 1/8 teaspoon cream of tartar
- pinch salt
- 50 grams granulated sugar (about 1/4 cup)
- 1/2 teaspoon vanilla
- food coloring

### **FOR THE FILLING-**

- 1/4 cup softened butter
- 3/4 cup powdered sugar
- 1/2 teaspoon vanilla extract
- 1 teaspoon milk

### **EQUIPMENT-**

- Electric beater
- Metal mixing bowl
- Piping bags
- Parchment paper
- Baking sheet



## **STEP BY STEP PROCESS:**

- ❑ The first step to making French macarons is to sift the almond flour and powdered sugar together two times, making the cookie batter very fine and smooth.
- ❑ The next step is to beat the egg whites together with an electric mixer on a medium speed until they begin to foam. Once they foam, add in the salt and cream of tartar which helps to stabilize the meringue.
- ❑ Continue to beat the egg whites while adding in one tablespoon of granulated sugar at a time. Increase the electric mixer to a medium to high speed until soft peaks form in the meringue.
- ❑ Once the sugar is mixed and soft peaks have formed, you can add in the vanilla and food coloring to the meringue. You can add additional flavors other than vanilla to the batter. Then beat the eggs until stiff peaks form.
- ❑ Using a rubber scraper, add the dry ingredients into the meringue while gently folding the dry and soft ingredients by folding them together. You should be able to make a figure 8 in the batter that will dissolve after roughly ten seconds.
- ❑ Line a baking sheet with parchment paper then spoon the batter into a piping bag. Squeeze the piping bag and make a circle roughly an inch and

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half wide. Continue to make more circles but allow for at least two inches between each macaron.

- ❑ Once all cookies are piped out onto parchment paper, tap the pan on the counter a few times to help release the air bubbles inside to batter so they don't rise while they bake. This would cause the shell of the macarons to crack.
- ❑ Allow the piped macarons to dry for an hour before you put them in the oven, you should be able to gently tap the top and feel a slightly firm shell on the outside.
- ❑ Ten minutes before the drying time is up, preheat the oven to 300 degrees Fahrenheit. Bake for 17-20 minutes then allow them to cool on the pan for at least five minutes. Then remove each cookie carefully and place them on a drying rack.
- ❑ As they dry, begin to cream the butter and powdered sugar from the filling recipe. Beat the sugar and butter together until it becomes soft and smooth, then add the milk, vanilla or any flavoring.
- ❑ Once the macarons are cool, grab two cookies then using a piping bag, add the filling onto one macaron. Place the top macaron onto the one you have put the filling on.
- ❑ The last step is to enjoy!

## **HISTORY and SCIENCE:**

Macaron is a word that comes from Italy, it is believed that they were later brought to France. As this delicious treat has traveled to other countries, its recipe has been changed and there are many different styles of macarons. The recipe shown above is a standard french macaron recipe however, there are many other recipes, for example the italian macaron. The most common macarons today, which are shown as a sandwich like cookie with a filling comes from France in the 1830's. Due to

the many different variations of recipes, there are many different techniques that can be used to create a macaron that has a perfect foot, structured shell and a soft inside.

A common technique to create a macaron that has all of the characteristics said above is to age your egg whites. This is a process where you crack your eggs and separate the yolks and whites, you then allow the egg whites to sit in a glass container over the period of one to two days in a fridge. This helps to dehydrate the egg whites which decreases the egg whites elasticity resulting in a stiffer meringue. Egg whites are a diluted water and protein solution. Proteins are made up of chains of amino acids. These protein molecules are twisted in an almost spherical form, these tend to wrap around the water that surrounds the protein. As you dehydrate the egg whites, these water "pockets" are decreased. With less water, there is less air and bubbles in the meringue which make a much firmer meringue. When you beat egg whites, the egg white proteins unfold and form into new bonds between the negatively and positively parts of the molecules. Once the stiff peaks form, the protein molecules have bonded enough to create cages around the water droplets within the egg whites. Below is a demonstration of the process of egg whites forming into a meringue:



## **EXPERIMENT:**

In my own experiment I used three different recipes. The egg whites were my independent

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variable and I was measuring the effects this had on the chewiness as well as the amount the macarons rose which were my dependent variables. I used the first recipe as my first trial, where the egg whites were beaten right away. All other ingredients and steps remained the same in each trial except for the amount of time the eggs were aged. After making my first batch of macarons where the egg whites were not aged I measured the height of the cookies. I found that on average these macarons rose to 0.583 cm, which was my quantitative measurement. For my next trial, I aged the egg whites for four hours before I whipped them. They had an average of 0.916 cm once they were baked and dried. For my last trial I aged the egg whites overnight for 24 hours. My quantitative for the amount my third trial rose came to a 1.16cm average. These results show that the longer the egg whites age, the more they end up rising.

Trial 1	Trial 2	Trial 3
0.583 cm	0.916 cm	1.16 cm

I took qualitative measurements from a group of peers in addition to the quantitative measurements. I had each person try one of each macaron without them knowing which macaron was which. I then gave them a survey which asked them to rate each macaron on the chewiness. From my results I also found that trial 3 resulted in a higher rate for chewiness.

All results stated that test number three was the chewiest. Nearly 100% of the students survey stated that the second chewiest macaroon was the second trial. Majority of people voted that the least chewiest trial was the first, which was one where the eggs were not aged at all. With both the qualitative and quantitative results are able to show that ageing egg whites increases macaroons chewiness and overall structure.