



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Jared Saal	Project Number J1723
Project Title How Particle Size Affects Viscosity of Chocolate	
<p style="text-align: center;">Abstract</p> <p>Objectives My goal was to determine how particle size affects viscosity of chocolate.</p> <p>Methods My project materials are: stir sticks, micrometer, baking pan, chocolate (sugar, cocoa nibs, cocoa butter), oven, timer, measuring spoon, IR thermometer, chocolate refiner, ruler, scale. To conduct my experiment I got the same batch of chocolate with different particle sizes. The first size was 107 microns, my second size was 36 microns and my third size was 23 microns. For my control the particle sizes were 27, 24 and 16 microns. I heated all the batches to 60°C which is higher than the melting temperature of chocolate. I also heated the measuring spoon and pan to 60°C with the chocolate. Then I took everything out and measured one tablespoon of chocolate and poured it on the pan when it was flat. After I put the pan at a 55 degree angle. Then I let the chocolate flow for 60 seconds and then measure how far the chocolate has traveled. I do that process three times for each batch and then average them out.</p> <p>Results Three samples of 70 and 100 percent dark chocolate were tested, each with only the particle size changing between them. The results showed that the bigger particle size flowed better than the smaller in 70% dark chocolate but in 100% dark chocolate (with no sugar or cocoa butter) it was the opposite.</p> <p>Conclusions By testing the three ingredient 70% dark chocolate, I concluded that the smaller particle size chocolate is more viscous than the bigger particle size chocolate. The reason this happens is that there is cocoa butter in the chocolate and the cocoa butter coats the sides of the particles which allows them to flow. The reason that the bigger particle size chocolate is less viscous is because the total surface area of the particles is much less. Therefore, the cocoa butter is able to coat more which allows the chocolate to flow better. Also, I concluded that if you have 100% dark chocolate(with no added sugar or cocoa butter)it is the opposite than the 70% dark chocolate. This is because when the particles are ground up, they release cocoa butter from the cells and the more cocoa butter you release the better it will flow.</p>	
Summary Statement By measuring the distance that chocolate traveled, I determined how the viscosity of chocolate changes at different particle sizes.	
Help Received My Dad helped me make the chocolate samples with his chocolate refiner.	