

## **When the Bloom is on the Chocolates**

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Over the years, there are several things that I've learned about chocolate-making. It involves a lot of art, considerable scientific input, and just a hint of magic.

Although chocolatiers may remove magic from the equation, the experts tend to agree that there is a phenomenal amount of science and art that go into creating these delicacies that many of us enjoy so much.

Cocoa pods are harvested, naturally enough, from cocoa trees in tropical climates – predominantly in West Africa. The seeds inside the pods are rather bitter and must be naturally fermented to develop the flavour that we associate with them. Once dried and roasted, the cocoa bean shells are removed and a “nib” is obtained. The nib is ground and heated to form chocolate liquor. It is from this liquor that cocoa butter is obtained.

Cocoa butter is one of the main ingredients in milk chocolate which also contains cocoa solids, sugar, and milk solids. At this stage, the mixture has large enough particles in it that it would have a gritty mouthfeel. To get around the problem, the liquid mixture is “conched” by subjecting it to frictional grinding between large, heavy rollers and a firm, solid surface. The more the mixture is conched, the smaller the particles become, and the smoother the chocolate will be when eaten. Some conching operations can take up to three days.

Liquid chocolate needs to solidify after being conched. Here is where an element of science comes into play big-time. As it solidifies, or tempers, the cocoa butter forms crystals. Formation of these crystals must be controlled to maintain a high quality, and incorporate the desired characteristics to the product.

I recently sat through a presentation where a doctoral candidate described six or so different crystal structures that can result during this tempering process. Obtaining the correct distribution of crystal formations can dictate the melting point of the chocolate, which ultimately impacts whether the chocolate will melt in your mouth or at a lower temperature.

Some of you may have seen chocolate with a white discolouration on its surface. This is called chocolate “bloom”. At first glance, you may think that the chocolate has started to go bad, but this is not actually the case. The chocolate is undergoing a process called “blooming”, for which there are two possible causes.

In the case of “fat blooming”, what is happening is that the cocoa butter is separating from the rest of the ingredients in the chocolate mixture and is migrating to the surface

of the chocolate. It is the result of storing the chocolate at higher than recommended temperatures. Chocolate should be stored under cool, but not cold, conditions. If the temperature rises above about twenty-four degrees Celsius, there can be problems with bloom developing as the cocoa butter separates from the chocolate.

“Sugar blooming” occurs if chocolate is stored below about fifteen degrees Celsius. Here sugars start separating from the mixture and create a whitish film on the surface of the chocolate. The same thing can happen if the chocolate is stored under highly humid conditions.

Most of you may not have to worry too much about chocolate sitting around under non-ideal storage conditions long enough to start showing signs of blooming. However, if you do see either fat bloom or sugar bloom on the surface of a piece of chocolate there is no risk to you in eating it.

In the meantime, just sit back and enjoy the pleasures of some high-quality chocolate and think about the science that has gone into it.



**High quality chocolates such as these involve some complex food science.**