

# The Crystallization of Ganache

*The temper of the chocolate and the temperature of the cream are the key variables in making ganache for slabbed confectionery use.*

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The objective of this paper is to observe the textural and visual differences in ganache made by varying techniques in order to determine the effect of chocolate precrystallization on the finished ganache, and arrive at the optimum method for making ganache for slabbed confectionery use.

This informal investigation was performed by a chocolatier, confectioner and pastry chef with over 25 years' experience in the field, and essential knowledge of confectionery technology. The work performed and observations made were under professional kitchen conditions, not in a laboratory. The results were evaluated in a qualitative way, based on the senses and experience of the author, and the conclusions reached are intended for practical application. The ultimate goal is to help confectioners gain a clearer understanding of how the method used to make ganache affects the outcome of the product. Further investigation of the topic under laboratory conditions using instruments to obtain quantitative results would provide another perspective on the subject.

The experiment utilizes a relatively stan-

dard formulation for a confectionery ganache: two parts dark chocolate to one part liquefier, which includes 50 g of Grand Marnier as a flavor. Glucose syrup has been added as a stabilizer for the emulsion, as well as for preservation. The heavy cream used was 40 percent butterfat; the chocolate was 64 percent total cacao, 38 percent total fat (cocoa butter) (Figure 1).

Each batch of ganache was made using the identical formula, with the variables of different forms of chocolate and different temperatures of cream. The specific variables were chosen because they represent some of the more common variables in making ganache, and because they help to illustrate the effects of the temper of the chocolate and the temperature of the cream.

After mixing, each ganache was immediately poured into a frame one-half inch thick on a sheet of plastic, and allowed to

## Standard Confectionery Ganache

Heavy Cream	250 g
Glucose Syrup	75 g
Dark Chocolate, 64% Cacao	600 g
Grand Marnier	50 g

Figure 1



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## The Crystallization of Ganache

crystallize overnight (approximately 18 hours) at a room temperature of 20°C.

The next day, each ganache was evaluated for its surface appearance, its firmness and cutting quality, its internal appearance and its mouthfeel. From these observations, hypotheses are presented as to the causes of the various qualities, and a conclusion is reached regarding the best method for making ganache for slabbing. Variation A is the control in the experiment, as it is the method that is published by this author in *Chocolates & Confections: Formula, Theory and Technique for the Artisan Confectioner*. (John Wiley & Sons 2007).

The variations used in this investigation are listed in Figure 2.

Upon mixing, each ganache was smooth, showing neither signs of a separated emulsion nor of any unmelted chocolate. The ganache was immediately poured into the frame without undue agitation, and was not tabled to temper it prior to depositing, as for a piped ganache.

### OBSERVATIONS FROM THE CRYSTALLIZED GANACHE

#### Variation A, Control

See Figure 3

**Surface Appearance** Smooth exterior, no signs of fat bloom, uniform color and appearance.

**Firmness and Cutting Quality** Firm, yet malleable. Does not crack when pressed to indent. Cuts cleanly, and is cohesive enough to release from the plastic in one piece when cut.

**Internal Appearance** The interior appears smooth and homogeneous. No visible irregularities.

**Mouthfeel** Smooth and creamy. The ganache melts uniformly in the mouth at a moderate pace, leaving no graininess behind.

#### Variation B

See Figure 4

**Surface Appearance** Some fat is visible in streaks on top of the crystallized ganache; spots also can be seen on the surface.

**Firmness and Cutting Quality** Firm texture, slightly brittle. Cracks when depressed to indent. When cut, creates small ridges of ganache on each side of the cut. Lacks cohesiveness. Breaks apart easily when pulled from the plastic on which it had crystallized.

**Internal Appearance** The interior texture exhibits visible graininess.

**Mouthfeel** Short textured and grainy. Although most of the ganache melts readily in the mouth, very palpable hard grains linger and melt much more slowly.

#### Variation C

See Figure 5

**Surface Appearance** A lot of fat is visible in streaks on top of the crystallized ganache. A few spots are also visible, although they are not as noticeable as the spots on variation B.

**Firmness and Cutting Quality** Firm, short texture that cracks when depressed to indent. Creates very noticeable ridges of ganache when cut. Slightly less prone to breakage after cutting than B, more so than A.

**Internal Appearance** Obvious and large grains in the interior of the ganache. Fewer grains than B, but noticeably larger.

**Mouthfeel** Short textured and grainy. Although most of the ganache melts readily in the mouth, very palpable large grains linger and melt much more slowly.

#### Variation D

See Figure 6

**Surface Appearance** No fat is visible on the surface of the ganache. Many small spots appear prominently on the top.

**Firmness and Cutting Quality** Relatively soft texture that gives way easily without cracking when depressed to indent. The ganache does not cut cleanly, but becomes distorted and forms slight ridges when cut. The cut ganache is not cohesive enough to release easily from the plastic; it stretches and tears when released.

**Internal Appearance** The interior has an abundance of smaller grains apparent in it.

**Mouthfeel** Elastic texture, with a small amount of slower melting grains left after the ganache melts in the mouth.

The hypotheses from these results are all related to the crystallization of the fat in the ganache. There was no evidence of separation of the emulsion in any of the variables, therefore it is not a factor in the results. While the combination of butterfat and cocoa butter in ganache is polymorphic due to the cocoa butter content, it is unlikely that different forms of fat crystals caused the differences between the variations, because they all crystallized under identical temperature conditions; they therefore crystallized with the same form of fat crystal. The more probable explanation is the presence or lack ➤

## Standard Confectionery Ganache

Variation	Condition of Chocolate Used	Temperature of Liquids Added	Mixing Technique
<b>A Control</b>	Melted, tempered chocolate @ 32°C	40°C	Boil cream and glucose syrup Remove from heat Add Grand Marnier Cool liquids to 40°C Mix liquids into melted tempered chocolate
<b>B</b>	Melted, untempered chocolate @ 32°C	40°C	Boil cream and glucose syrup Remove from heat Add Grand Marnier Cool liquids to 40°C Mix liquids into melted untempered chocolate
<b>C</b>	Tempered, unmelted chopped chocolate @ 20°C	Just off of boil	Boil cream and glucose syrup Remove from heat Add Grand Marnier Pour hot liquids over chopped tempered chocolate Allow to sit 60 seconds Stir until homogeneous
<b>D</b>	Untempered, unmelted chopped chocolate @ 20°C	Just off of boil	Boil cream and glucose syrup Remove from heat Add Grand Marnier Pour hot liquids over chopped untempered chocolate Allow to sit 60 seconds Stir until homogeneous

Figure 2

### Variation A (Control)



Figure 3

### Variation C



Figure 5

### Variation B



Figure 4

### Variation D



Figure 6



## The Crystallization of Ganache

of seed crystals to initiate rapid and even crystallization of the ganache.

Variation A was precrystallized by the presence of seed crystals in the melted tempered chocolate. Although the liquids were at 40°C, when heat loss of the system is taken into account, at no time did the mixture reach a sufficient temperature for enough time to melt the seed crystals in the chocolate. As a result, this ganache crystallized rapidly and uniformly throughout, just as properly precrystallized chocolate will set rapidly, and with a smooth, uniform texture. Variation A solidified after only two hours, long before any of the other variations showed any signs of hardening. This ganache will cut cleanly on a guitar, and will have positive handling attributes, not crumbling or becoming distorted during handling. Because this ganache is well tempered, it will be stable throughout its shelf life, not losing quality under proper storage conditions.

Variation B contained no cocoa butter seed crystals, as the chocolate was not itself tempered. As a result, the ganache was underseeded, and crystallized slowly, without uniformity. The slow crystallization allowed some of the fat to migrate to the surface before the ganache set, accounting for the fat streaks that are visible on the surface. Like untempered chocolate, due to the lack of seed crystals, fewer, larger fat crystals formed, causing the grainy texture of the ganache and the spots on the surface. This variation will not cut cleanly with a guitar, leaving ridges on the corners, and will tend to break during handling. Given time, these crystals will become more prominent, resulting in visible bloom and a more uneven texture, just as they do in underseeded chocolate. As a result, the textural quality of the ganache will continue to deteriorate during the expected shelf life of the centers.

Variation C is the most commonly used technique for making ganache, utilizing tempered unmelted chocolate. Because this chocolate is tempered, it contains cocoa butter crystals that are not only in a stable form, but are small and well distributed. This variation, however, did not set evenly as tempered ganache should. The heat from the liquifiers was too high and melted most or all of the seed crystals that the tempered chocolate contained. As a result, this variation contained insuf-

ficient seed crystals, causing the growth of fewer and larger fat crystals than desired, leading to the grainy mouthfeel and the spots on the surface, similar to Variation B. This ganache will not cut cleanly with a guitar, leaving ridges on the corners, and will be prone to breakage during handling. Ongoing crystallization of the fats will result in a deterioration of the mouthfeel during the shelf life of the centers.

Variation D likewise contained insufficient fat crystals to adequately seed the ganache. Because the chocolate that was used to make the ganache was untempered, it contained large and uneven fat crystals. The heat of the liquids melted most of these crystals, just as they did in variation C, resulting in an underseeded ganache with all of the same flaws as variations B and C. This variation will be difficult to release from the plastic on which it has set, and will distort when cut on a guitar and during handling. The graininess of variation D will also increase during the life of the centers as the fats continue to crystallize.

### CONCLUSION

The conclusion of the investigation is that the preferred method for making a ganache that is to be slabbed and cut without any tabling is to use Variation A to provide the most consistent results of a smooth product that cuts cleanly and maintains its fine texture throughout the shelf life of the ganache.

- Begin with tempered melted chocolate at 30°C for dark chocolate.
- Add liquifiers at 40°C; stir to emulsify.
- Pour into frame, and allow to crystallize overnight at room temperature.

Ganache is a surprisingly complex system involving a fat-in-water emulsion as well as the crystallization of a polymorphic fat. It is affected by myriad factors such as dissolved solids content, cacao particles and pH, among others, all of which contribute to its complexity, yet it is ubiquitous throughout artisan confectionery. In spite of its importance in the confectionery world, there is a dearth of studies on how ganache functions as a system. I invite and welcome the scientific community to perform more complete quantitative investigations into the intricacies of ganache that would greatly benefit the body of knowledge about this beloved center. □