Baking: Viennoiserie – Laminated Pastry Production

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A Brief History of the Croissant from the 17th Century

The birth of the croissant was the result of a series of evolutionary steps. Moon-shaped pieces of bread are documented in Enenchel’s 13th-century poetry as being presented by Viennese bakers to Duke Leopold of Austria in 1227 to celebrate the Austrian victory over their Turkish invaders (Chevallier, 2009); this pastry, known as Kipferl, was a crescent/horn-shaped formed bread. Some historians maintain that the Kipferl originated in monastic bakeries. The Kipferl was first mentioned in records from the 12th century (Savic, 2019), and it was enriched using large quantities of butter/lard, almonds, and sugar (Fiegl, 2015).

After lamination was introduced (the story is better documented in François Pierre de La Varenne’s 1653 book Le Pâtissier François), the Kipferl became the French croissant as we know it today through the merging of the Austrian Kipferl and the French puff paste lamination technique (Chevallier, 2009; Goldstein and Mintz, 2015).

Other origins are proposed. According to the Culinary Institute of America (Culinary Institute of America, 2016), the croissant would have been created first by the Hungarian bakers of Budapest to signify and celebrate the liberation of their beloved city from the Turkish army in 1686. But there is another story (Chevallier, 2009) that the creation was by the Austrian bakers in Vienna, who were besieged in 1683 by Turkish invaders: the legend recounts that the Viennese bakers, while at work early in the morning, heard the Turkish army digging under the walls of Vienna; they alerted their army commanders, and the Turks were routed. The croissant was created to celebrate the liberation of Vienna: its shape and the name were a consequence of the crescent moon, a symbol of Turkish tyranny.

It is also said that the French and Italian bakers soon followed their Viennese counterparts and included this pastry as a part of their daily breakfast. The croissant in its original classical form was very different from today’s creation, as it was made using puff paste with lard and milk, a laminated dough devoid of yeast (Chevallier, 2009). Willan (2016) corroborates Chevallier’s story of how the croissant arrived in Paris, at least in 1839 (some say 1838), when an Austrian artillery officer, August Zang, founded a Viennese bakery (“Boulangerie Viennoise”) at 92, rue de Richelieu in Paris. This bakery, which served Viennese specialities including the Kipferl and the Vienna loaf, quickly became popular and inspired French imitators (and the concept, if not the term, of viennoiserie, a 20th-century term for supposedly Vienna-style pastries). Indeed, this was at the best time, because falling sugar prices toward the end of the 17th century enabled the rising wealthy merchant dynasties in the prosperous cities of Vienna and Paris to trade in sugar, which had once been available exclusively to royalty. Café culture, as we know it, was born in 1683 in Vienna (City of Vienna, 2019), and Paris was introduced to coffee three years later in 1669 by a Turk, Hüşrev Mehmed Nüreddin Süleyman Ağâ, who was dispatched by sultan Mehmet IV as his ambassador to the court of King Louis XIV. Records indicate that Paris’s first genuine coffee house was Café de Procope, which opened in 1686 (Arat, 2019). It soon became popular and was frequented by famous historical figures such as Voltaire, Rousseau, and Diderot, among others. Café culture involved meeting over tea, coffee, and cake to discuss revolutionary ideas against King Louis XIV (Bramen, 2010).

Viennoiserie: A Modern Twist

Laminated viennoiserie pastry is made by rolling and folding butter and a yeasted dough together to form a block of pastry containing many layers, as seen in Figure 8.1. First, with fermentation, the layers of dough expand (Hartings, 2016), and this expansion, along with the separation of sheets of dried dough, is increased during the baking process.

First, the fermentation by the yeasts generates carbon dioxide bubbles that make an aerated dough, the bubbles being trapped by the viscosity of the dough and also by the viscoelastic “gluten” network created during the first steps of dough making, when flour is kneaded with some water (and possibly butter) (This, 2018). During baking in a hot oven, the surface of the fermented dough is heated, and the heat is transferred toward the interior by conduction, with five main effects: (1) the expansion of CO₂ bubbles, (2) killing the yeasts when the temperature inside the dough is over 60 °C, (3) the vaporization of water from the dough, with steam separating the dough layers, (4) drying the dough and making crisp layers, and (5) creating a colour at the surface of the pastry (Figure 8.2).
The first effect is a simple thermal expansion, due to the increased velocity of CO\textsubscript{2} molecules, responsible for an increased pressure on their interface with the dough. The third effect is visible at the edges of puff pastry during baking: steam can be seen bubbling at the edges of the sheets. This steam is formed because the temperature inside the laminated pastry reaches 100 °C, and the effect of this evaporation is important, because 1 g of water generates about 1 L of steam; and during the baking of puff pastry, as much as 20% of the weight is lost: this means that a volume of about 20 L is produced for 100 g of dough, which is enough for a very large expansion of the dough (This, 2020).

The degree of lamination and the care shown during the lamination process define the volume and appearance of the baked product. It is sometimes said that egg washing the pastry before baking moistens the surface of the pastry, preventing the dough from forming a thick skin or crust initially; the function of the retarding effect of the egg wash on bakery products would be to delay the formation of crust and allows the pastry to achieve full volume (Peterson, 2012). However, an experiment done by H. This did not corroborate this “culinary precision”.

Of course, the colour of the upper surface is important as well: it is due to protein degradation, as can be understood from a comparison of grilling (in a pan) flour and starch: only flour turns brown, due to the presence of the proteins that are absent from starch. Butter browning during baking contributes also. And of course, if sugar (sucrose) is added in the dorure, caramelization can occur, as the baking temperature is generally higher than the 140 °C needed for caramel formation (Defaye, 1994; Luna and Aguilera, 2013).

All these effects have to be controlled by the baker and contribute to the success of the participants of the Coupe du Monde de la boulangerie (CDM), a competition held every three to four years in Paris that is an arena where the world’s best bakers go head to head, competing for the title of World Champion of Bakery. The competition has led to much innovation in the field of viennoiserie products made of brioche dough and yeasted laminated pastry. The process that was used to develop the product for Ireland’s participation in CDM in 2002 is explained in the following section.

### Production of Laminated Pastry

#### Dough Stage

- 500 g Strong flour
- 7 g Salt
- 25 g Milk powder
- 20 g Butter
- 35 g Fresh yeast
- 45 g Caster sugar
- 50 g Egg
- 210 g Water

Total 892 g

**FIGURE 8.1** Laminated pastry cut to reveal the alternating layers of dough and fat.

**FIGURE 8.2** Mechanism of pastry lift during baking.
Method

- Disperse yeast, sugar, and egg in water
- Add liquid to the flour and mix to a dough

Lamination Stage

- 330 g chilled butter for lamination
- Laminate as described later
- Total pastry weight: 1222 g

Dough Stage

Sieve the flour, milk powder, and salt together; rub the butter into the flour. The dough should be mixed on a 20-quart Hobart-type mixing machine using a dough hook attachment. Mixing times of two minutes on the first speed and six minutes on the second speed are recommended. The mixed dough should be moulded into a ball, placed into a container that will allow for the expansion of the dough during the cold fermentation process, and sealed tight or covered with plastic to prevent skinning.

The dough is fermented for 45 minutes at room temperature, followed by overnight fermentation in a fridge at a temperature of 3–6 °C. The dough is then degassed by sheeting it through a pastry break set to 10–12 mm thickness, wrapped in plastic to prevent skinning, and placed in a freezer to stiffen the dough and chill it close to 0 °C for 30 minutes. The dough is then taken from the freezer and formed into an even rectangle. The butter block is placed in the centre of the dough rectangle as illustrated in Figure 8.3, and the centre is sealed by pinching the dough together, leaving the ends exposed with butter showing at each end.

At this stage, the pastry contains three layers, two dough layers on the top and bottom, with the butter layer at the centre. The dough to the sides of the pastry block can also be sliced to ease the processing, which is known as the sandwich method (Figure 8.4). In this process, the first stage is known as the “Lock-in”, as the butter is locked in between two layers of dough.

The following example explains how a Lock-in 3-turn followed by a second 4-turn determines the number of layers developed by lamination and emphasizes the need to factor in the dough contact points. The left-hand side of Figure 8.5 shows the dough after folding a 4 from the Lock-in after sheeting. During sheeting, the shaded areas/the dough touching points compress and form one layer of dough, as illustrated in Figure 8.5; hence the need to subtract one layer for each dough contact point to determine the actual layers.
Lamination Sequencing 3 4 3

The dough and the butter will have a similar consistency, which allows the pastry to be sheeted with ease without breaking down either the dough layers or the butter. The sheeting of the pastry block followed by folding sequences allows layers of dough and butter to build up simultaneously.

Following the Lock-in, the dough now contains three layers, i.e., dough, butter, dough. This is known as the first 3 of the lamination sequences. The dough is placed on the sheeter and rotated 90° from the formation of the Lock-in so that the seam formed is pointing horizontally towards the machine rollers. The thickness of the dough is gradually reduced, 3 mm at a time, to a final thickness of 6 mm on a pastry break. The pastry should then be given an offset book turn or a 4-fold, as illustrated in Figure 8.6.

An offset method of folding is recommended, as this reduces the possibility of a bulge in the leading edge of the pastry block, which can result in uneven sheeting. At this stage, it is recommended that the pastry is rotated 90° with the closed seam facing the operator and reduced to a 12 mm thickness on the pastry break, wrapped in plastic, and placed in a freezer at −18 °C for 20 minutes. The 90° rotation of the pastry ensures that the dough is stretched in each direction evenly throughout the process, which eliminates shrinkage in the final proofing and baking stages of production. Reducing the pastry to a thickness of 12 mm enables the freezer to reduce the core temperature of the pastry rapidly, controlling the fermentation until the proving stage.

As the pastry at Lock-in initially had three layers or a 3, it was sheeted and folded into four or a 4. One would imagine that 3 × 4 would equal 12 layers; however, where dough touches dough in the folding process, known as “The Dough Contact/Touching Point”, one layer is subtracted at each dough contact point. Under compression, the dough merges to form a single dough layer while the butter layer remains unchanged. In the case of a 4, three dough touching/contact points are counted, leaving a total of nine layers of dough and butter.

The chilled pastry is then removed from the freezer for its final sheeting and folding. Once again, it is essential to rotate the pastry 90° so that the closed seam is facing the operator. The pastry is then sheeted to a thickness of 8–10 mm and given a half-turn or a 3. At this stage of the process, the pastry contains 9 × 3 layers or 27 layers. However, as there are two dough contact

![FIGURE 8.5 Illustrating dough on dough layering after folding three to four times with dough touching points.](image)

![FIGURE 8.6 An offset 4-fold noting the open and closed ends of the pastry block.](image)
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points, as seen in Figure 8.7, two layers are subtracted from the total, and the finished pastry now has a final total of 25 separate alternating layers of dough and butter. The dough should again be rotated 90°, with the closed end facing the operator, sheeted to a thickness of 12 mm, wrapped in plastic, and chilled in a freezer at −18 °C for 30 minutes.

The pastry is now ready for the preparation of many different types of viennoiserie, such as classic croissant, pain au chocolat, or pain au raisin (Figure 8.8).

REFERENCES


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