SPARKLING WINE PRODUCTION

CHAPTER SIX

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LEARNING OBJECTIVES

After studying this chapter, the candidate should be able to:

- Describe how sparkling wines are produced.
- Identify which grape varieties are commonly used in sparkling wines.
- Recall the sequence of events that takes place during the traditional sparkling wine production process.
- Recognize the different style categories of sparkling wines.
- Recall the terminology relating to sparkling wines.

Carbon dioxide is a naturally occurring by-product of the fermentation process. During the production of still wines, this gas is encouraged to disperse throughout the winemaking process. However, if fermentation takes place in a sealed container and the gas is not allowed to escape fully, the pressure will build up, and the carbon dioxide will be absorbed into the wine. If the wine is then handled in such a way that the gas remains dissolved in the wine while in the bottle, columns of bubbles streaming continuously toward the surface will appear in the glass upon opening and pouring the wine.

Effervescent wines have been known since antiquity—when they were developed completely by accident—as incompletely fermented wines that had been stored in the chill of winter would begin to spontaneously re-ferment when temperatures rose in the spring. Now known as the *méthode rurale (rural method)* or *méthode ancestral (ancestral method)*, this process remains in use today by a small number of producers.

The most famous and highly regarded process for creating a high-pressure sparkling wine is known as the *traditional*, or *classic, method*. This is the method used in the Champagne region, where it may be referred to as the "Méthode Champenoise." This method involves producing a base wine, adding a measured amount of sugar and yeast, and initiating a second fermentation in the sealed bottle.

Due to the evolution of Champagne's export trade in the late eighteenth and early nineteenth centuries, "champagne" became the default term for sparkling wine worldwide. Even after such wines began to be commercially produced in many other countries, they were still known almost universally as "champagne." Eventually, the Champenois objected to this usage and began a long campaign against the use of the term *champagne* to describe any wine except those sparkling wines made within the boundaries of the Champagne region.

This move by the Champenois was one of the earliest examples of the protection of a place-name, and it has been largely successful. Most countries now outlaw labeling a domestic sparkling wine as champagne. In the United States, certain wines may be labeled as champagne as long as a place-name is appended, such as "California Champagne." Labels submitted for approval after March 10, 2006, however, are not allowed to use the term. Additionally, some producers are voluntarily retiring their grandfathered labels in a show of support for protecting the place of origin.

GRAPE VARIETIES FOR SPARKLING WINE

In principle, it is possible to make sparkling wine out of any grape, and a wide assortment of varieties is used for the production of sparkling wines throughout the world. The main grape varieties that came to be used in the Champagne region for sparkling wine are Chardonnay, Pinot Noir, and Meunier (Pinot Meunier). This combination worked well for the cool climate of the region and for the high-acid, moderate alcohol, yeast-driven style of Champagne.

Other areas in Europe use different indigenous grapes for their sparkling wines, including the following:

- Chenin Blanc in France's Loire Valley
- Riesling in Germany
- Xarel-lo, Macabeo, and Parellada in Spain
- Muscat (Moscato), Brachetto, and Glera (Prosecco) in Italy

Outside of Europe, most wine regions have little or no limitations on the grape varieties that may be used in the production of sparkling wines. Nevertheless, many producers—particularly those able to source grapes from cool climate regions—feature Chardonnay and Pinot Noir in their sparkling wines. However, many regions produce sparkling wines from their most successful locally grown grape varieties. Examples include sparkling Shiraz from Australia, sparkling Sauvignon Blanc from New Zealand, and sparkling Riesling from New York State.

THE TRADITIONAL METHOD OF SPARKLING WINE PRODUCTION

The method of sparkling wine production employed in Champagne—referred to as the traditional or classic method (in various languages)—is used with only minor variations all over the world. Many of Europe's premium sparkling wines—including Cava (produced in Spain), Franciacorta (produced in Italy), and Crémant (produced in certain appellations in France)—use this traditional method (known as the *méthode traditionelle* in French). The highest-quality sparkling wines from California, Oregon, South Africa, Australia, Argentina and beyond do as well.

The traditional method entails making and bottling a dry, still, high-acid, and low-alcohol wine. The winemaker then adds a precise amount of yeast and sugar to the wine, which is immediately capped. The fresh yeast and sugar start a second fermentation in

the bottle, which takes about thirty days to complete. After this second fermentation, the wine is aged on the lees while still in the bottle. This allows some of the lees to dissolve and be absorbed into the wine. After aging, an elaborate procedure is used to collect the sediment in the neck of the bottle and dispose of it, leaving the clear, sparkling wine behind in the bottle. The wine is then quickly topped up, presenting the winemaker with options for adding sweetness, and then resealed for eventual sale.

In the United States, sparkling wines made by these procedures are identifiable by the term "Classic Method" or "Traditional Method," or by the phrase "Fermented in This Bottle" on the label.

BASE WINE PRODUCTION

The production of the base wine that will later become sparkling wine typically proceeds like the winemaking for any other light white wine. However, grapes used for traditional method sparkling wines are typically harvested quite early (to maintain a low sugar/high acid character), and there is quite an emphasis placed on gentle handling of the grapes in order to ensure that as few bitter or harsh components as possible are transferred from the skins into the juice. In addition, careful handling minimizes color transfer from red grape varieties, such as Pinot Noir, that are often used for the white base wine.

This emphasis on gentle treatment typically begins with hand harvesting of the grapes (rather than harvesting by machine) and using small bins for storage, so the grapes are not crushed by the weight of other grapes. At the winery, the grapes may be hand sorted to remove damaged bunches. Whole-cluster pressing is the norm, keeping the juice inside the skins until the last moment and then rapidly, and with minimal force, squeezing the juice out and separating it from the skins and seeds.

The traditional Champagne press is a wide, flat basket press still used today, although modern bladder-type presses are more

common both in Champagne and elsewhere. The soft and flexible surface of the inflatable bladder is less likely to break the skins' cellular structure and release bitter phenolics than are older mechanical presses.

A series of pressings is conducted, first at a relatively gentle pressure and then at increasingly greater pressures. The first pressing releases most of the juice with minimal force. This juice is of the finest quality, and the winery's best wine will be made from it. Depending on the winemaker's assessment of its quality, juice from later pressings may be combined with the first or may be used for different wines. The last pressings inevitably pick up more bitter components from the seeds and skins and are generally unsuitable for fine sparkling wine. This juice may be used to produce still wine, fortified wines, spirits, vinegar, or other products.

The juice that is destined for sparkling wine is allowed to rest for a short period of time in order to allow any sediment to settle to the bottom of the holding tank. If necessary, must adjustments are carried out to improve the must's balance. A normal fermentation is then initiated; stainless steel tanks, oak casks, and concrete vats are all used in the production of sparkling wine. The winemaker may also elect to complete malolactic fermentation at this stage; however, high acidity is considered a hallmark of these wines.

Table 6–1: Sparkling Wine Vocabulary

SPARKLING WINE VOCABULARY	
Débourbage	Juice settling
Dégorgement	Disgorging, disgorgement
Prise de mousse	"Seizing the foam," the second alcoholic fermentation
Pupitre	Riddling rack
Remuage	Riddling
Réserve	Still wine from earlier vintages, used in blending
Transversage	Transfer between bottles

BLENDING

In a large sparkling wine production facility, the winemaker will have a myriad of separate lots of base wines. These wines may be from different pressings, different grape varieties, and different vineyards, and they may include réserve wines from previous vintages. These wines are sometimes used separately to create a sparkling wine, but far more often they are mixed together in varying combinations and proportions to create one or more blends, or cuvées, that will supply a range of products with different characteristics. The blending stage is referred to by the French term *assemblage*.

Within a single brand's line of sparkling wines, there may be several cuvées. The most often seen are the following:

- *Prestige:* These top-quality wines are also known as *tête de cuvée* and by other superlatives. This is, in theory, the brand's very best wine, made from only the earliest part of the first

pressing of the most exceptional fruit and treated with extraordinary care. It is usually also a vintage wine. Prestige wines are often sold in uniquely shaped or decorative bottles and at high prices.

- *Vintage:* These wines are produced from a cuvée of base wines made from grapes all harvested in the same year. The goal is to highlight the quality and unique characteristics brought on by the weather and conditions of that particular year. In Champagne, each production house may determine the years it will produce vintage Champagne.
- *Nonvintage:* These wines are produced from a cuvée that contains wines from more than one year's harvest. The base wines are chosen to construct a consistent flavor profile, or "house style," for which the brand has become known. This is normally the highest-volume category by far, and usually the least expensive.
- *Blanc de Blancs (white [wine] from white [grapes]):* This term refers to a cuvée made from white grapes. In the case of Champagne (or a sparkling wine made to emulate the style of Champagne), blanc de blancs is typically produced using 100% Chardonnay. It may be vintage or nonvintage.
- *Blanc de Noirs (white [wine] from black [grapes]):* When used to refer to Champagne, this term refers to a cuvée made exclusively from red grapes; in other regions it is often used to describe wines based primarily on red grapes. To produce this style of wine, red grapes are crushed and the juice is pressed off the skins very quickly after harvest. These wines—which may be vintage or nonvintage—sometimes take on a very pale salmon hue.
- *Rosé:* Rosé sparkling wines may be produced by creating a pinkish base wine or cuvée. Production methods include having both red and white wines in the blend, using a short carbonic maceration of red grapes before pressing, or creating a pink wine via saignée. Pinot Noir is the most common variety used to make the red portion of the cuvée. In some regions, it is permitted to produce rosé sparkling wines by blending in a small

amount of red wine along with the dosage; this may help to avoid potential browning during the lees-aging period.

Assemblage is followed by fining, racking, and cold stabilization before the wine is ready for the next stage.

SECOND FERMENTATION AND FINISHING

Up to this point, the traditional method is not markedly different from any other type of winemaking procedure. The differences become apparent during the next phase, when a second fermentation in the bottle traps the newly produced carbon dioxide in the wine.

Initiating Fermentation

When the time comes to begin the second fermentation process, a mixture of yeast and sugar called the *liqueur de tirage* is added to the cuvée. This mixture is immediately placed into heavy glass bottles with indented punts in the base, so designed to help withstand the pressure that will build in the bottle. The bottles are then sealed, usually with a temporary crown cap like that on a typical soda or beer bottle.

With sugar available, the yeast cells begin the second fermentation, breaking down the sugar and creating alcohol and carbon dioxide. The extra alcohol raises the level in the wine by a small amount, usually one to one and a half percentage points by volume. Typically, this causes the alcohol in the wine to increase from 10% or 11% to 11% or 12.5% abv. More importantly, the carbon dioxide gas builds pressure within the sealed bottle, causing the gas to dissolve into the liquid.

This second alcoholic fermentation occurs slowly due to the low temperature in the cellars or caves. The yeast cells also have difficulty multiplying in a wine that already contains 10% to 11% alcohol. The process can easily take a month or even longer.

Lees Aging

By the time the sugar has been used up, the pressure in the bottle is typically 5-6 atmospheres, or 75 to 90 pounds per square inch. At this pressure, the wine can hold a considerable amount of carbon dioxide gas, even though no bubbles can be seen through the glass.

As fermentation runs its course, the yeast cells die and begin to decompose, releasing compounds that create toasty, nutty flavors in the wine in a process known as *autolysis*. This is considered an important aroma and flavor component of traditional method sparkling wines. Also, it is one of the reasons that neutral base wine is used. In this way, the inherent flavor of the grapes themselves will not compete with the yeasty characteristics created through this production method.

The longer the wine remains in contact with the dead yeast before it is removed, the more apparent this flavor may become. Prestige and vintage sparkling wines usually are left for an extended time *sur lie*, that is, on the yeast lees. The longer aging time also allows the carbon dioxide to dissolve more thoroughly into the wine, which will ultimately translate into a finer, smaller bubble size in the glass.

Riddling and Disgorging

When the wine has rested on the lees long enough to achieve the desired style of wine, it is time to remove the sediment from the bottle. The challenge is to avoid letting out too much pressure, which is compounded by the fact that yeast cells tend to stick to the side of the bottle. The solution to this problem is a process called *riddling (remuage)*, which involves gradually turning the bottle upside down and giving it a series of gentle shakes to collect the yeast near the cap. This is followed by a process called *disgorging (dégorgement)* in which the bottle is opened, the yeast extracted, and the bottle resealed as quickly as possible.

Figure 6–1: Riddling racks

The traditional method of riddling, developed in Champagne in the nineteenth century, uses an A-frame rack with holes known as a *pupitre*. Every day for several weeks (or months), the bottles are shaken momentarily, partially rotated, and angled ever more vertically, causing the sediment to move down the side of the bottle and into the neck.

Hand riddling is still performed by a few sparkling wine estates, particularly for the most prestigious of bottlings. However, the time- and labor-intensive practice has been largely replaced by the use of large machines known as *gyropalettes*. Gyropalettes can hold as many as 500 bottles per crate and can complete the riddling process in less than one week, as compared to two to three months by hand.

When all of the lees are gathered in the necks of the bottles, the bottles may be allowed to rest in an upside-down vertical position—known in French as *sur pointe*—for some time prior to disgorging. When the winemaker determines that the bottles are ready for disgorging, the end of the bottle is typically dipped into an icy brine solution cold enough to freeze the sediment into a slushy "plug."

When the bottle is turned upright and opened, the internal pressure shoots the icy plug out of the bottle, leaving nothing but clear sparkling wine behind.

Dosage

Because a small amount of volume is lost during disgorging, the bottle is topped up to the correct level by adding a small wine addition known as the dosage or *liqueur d'expédition*. This step also creates an opportunity for altering the dry wine's style by adding sweetness. This is accomplished by adding some sugar to the dosage, which is often made using the same or a similar cuvée.

Because of the high acidity of the base wine, which is amplified in the mouth by the bubbles, it is standard practice to add at least a little sugar to the wine for balance. With a sugar addition that is barely, if at all, perceptible, the wine style is designated "brut." This is the most common style of Champagne and similar sparkling wines. The next most popular style is called "extra dry," which is a bit of a misnomer since the wine has noticeable sweetness. There are other styles, both sweeter and drier than these, as detailed in table 6-2.

Bottle Aging

After the bottles are topped up with the dosage, they are sealed with a specially manufactured large cork that is able to maintain a seal despite the 6 atmospheres of pressure pushing against it. The cork is super-compressed before insertion. The top part of this cork, extending out of the neck of the bottle, returns to its full width, giving it a mushroom shape when removed. For safety, the cork is held in place with a *muselet* (wire cage). Next, the bottles are generally cellared for at least a few months to give the dosage time to thoroughly integrate with the wine, after which time the wine can be released.

TRANSVERSAGE

Transversage—often considered a variation on the traditional method of sparkling wine production—is sometimes used to fill very small or very large format bottles. Such bottles—including *piccolos* (quarter bottles) and bottles larger than three liters—pose production-related and logistical issues regarding sur lie aging in the bottle and disgorging. To create these specialty bottle sizes, the steps of the second fermentation, lees aging, riddling, and disgorging may be completed in a typically sized bottle (generally 750 ml). After disgorgement, the wine is placed into pressurized tanks and the dosage (if any) is added. As the final step, the wine is transferred to bottles of various sizes and made ready for distribution.

TANK METHOD

Another method of sparkling wine production goes by several names: *tank method*, *Charmat*, *cuve close* (closed tank), and *bulk method*. In Italy, the term *Martinotti method* is often used. This process has a somewhat undeserved bad reputation as a shortcut that is a mere shadow of the traditional method, stemming from the fact that many inexpensive commercial products do use this technique to save time and money. However, numerous quality sparkling wines are made this way as well. Some consider this method the best choice for the production of sparkling wines made using aromatic grape varieties such as Muscat and Riesling, as the yeast aromas characteristic of the traditional method would be distracting and incongruent with these grapes. The tank process yields a wine that emphasizes youthful, floral, and primary fruit aromas. As a bonus, production costs are less than those for bottle fermentations.

Table 6–2: Sweetness Levels of Sparkling Wines

SWEETNESS LEVELS OF SPARKLING WINES

Category/Label Term	Sweetness	Sugar Quantity (g/L)	Percent (%) Sugar
Brut nature, sans dosage, pas dosé, dosage zero, brut sauvage	No sugar added	Less than 3	<0.3
Extra brut	Very dry	Less than 6	<0.6
Brut	Dry	Less than 12	<1.2
Extra dry, extra sec	Off-dry	12–17	1.2–1.7
Sec	Slightly sweet	17–32	1.7–3.2
Demi-sec	Sweet	32–50	3.2–5.0
Doux	Very sweet	More than 50	>5.0

In Champagne, the various categories of sweetness are regulated based on the sugar concentration in the finished wine, which is measured in grams per liter (g/L). These same terms are often used in other countries, but they do not necessarily have legal definitions, or else the regulations may differ, so the actual level of sweetness may vary slightly.

In the basic tank method, such as that used in the production of most of Italy's Prosecco and the majority of German Sekt, the second alcoholic fermentation takes place in a pressurized tank rather than in a bottle. The concept is the same as that of the traditional method, but it is performed on a larger scale:

1. Batches of grapes are fermented normally into dry, still base wines, which are then blended as desired into a cuvée.
2. Yeast and sugar are added to the tank of blended base wine.
3. The mixture ferments under pressure, keeping the carbon dioxide dissolved in the liquid.
4. If the intention is to replicate the Champagne style, the wine can be left on the lees for an extended time. However, since the ratio of surface area to wine is reduced, the autolytic character will not be as evident. For aromatic sparkling wines, lees contact is avoided since the emphasis is on fruit character rather than autolytic character.

As noted, the most troublesome part of the traditional method for sparkling wine is the removal of the yeast sediment from each individual bottle. The tank method bypasses this stage entirely by keeping the wine in the tank throughout the production process. The sparkling wine is racked to a different tank through a filter to remove

the sediment, and the dosage is added to the entire batch all at once. Once bottled, the wine may be bottle aged for a few weeks or months, or it may be considered ready for immediate release.

TRANSFER METHOD

The transfer method is a hybrid procedure that begins like the traditional method and then transitions to the tank method. After following the traditional method through the second fermentation and lees aging, all of the bottles are emptied into a pressurized tank. The wine is then filtered and the dosage is added to the tank. This eliminates the need for riddling and for the individual disgorging and dosage processes. After the bottles are cleaned, the wine can be put back into them for corking and sale.

The transfer method is advantageous in that it saves considerable time and effort by performing three important steps of the process in one pass rather than thousands of times in a row. All else being equal, these wines may achieve similar quality to those produced by the traditional method. However, if economy is the driving motive, the wine is rarely allowed to rest on the lees very long, so the usual flavor characteristics are less prominent. There is also a possibility that the filtration could remove some of the flavor components along with the sediment.

In the United States, sparkling wine made by the transfer method can usually be recognized by the phrase "Fermented in the Bottle" or "Bottle Fermented" on the label. This implies that the wine has not been fermented in that particular bottle.

PARTIAL FERMENTATION METHOD

The partial fermentation method is used for certain low-alcohol, sweet sparkling wines such as Italy's Moscato d'Asti; as such, it is sometimes referred to as the *Asti method*. Rather than conducting a

full fermentation of the base wine followed by a later second fermentation, this method involves a single, incomplete fermentation. In many cases, the initial carbon dioxide produced via fermentation is allowed to escape, after which the tank is sealed and pressurized. When the desired levels of alcohol and carbon dioxide pressure are reached, the wine is chilled to the point that fermentation is halted; later, the wine is sterile-filtered and bottled.

The partial fermentation method results in a low-pressure (around 2.5 atm), low-alcohol wine (often containing just 5% to 6% abv). Such wines typically contain significant residual sugar and—with little to no autolytic character—the fruity, often floral scents inherent in the grapes are retained as primary aroma and flavor components. Due to the low pressure, wine produced using this method may be bottled with a standard cork.

Table 6–3: Traditional Champagne Bottle Sizes

TRADITIONAL CHAMPAGNE BOTTLE SIZES		
Size	**Equivalent**	**Volume**
Piccolo/split	¼ bottle	187.5 milliliters
Half, or demi-bouteille	½ bottle	375 milliliters
Standard	1 bottle	750 milliliters
Magnum	2 bottles	1.5 liters
Jeroboam	4 bottles	3 liters
Rehoboam*	6 bottles	4.5 liters
Methuselah	8 bottles	6 liters
Salmanazar	12 bottles	9 liters
Balthazar	16 bottles	12 liters
Nebuchadnezzar	20 bottles	15 liters
*Discontinued as an official bottle size in 1989		

ANCESTRAL METHOD

The ancestral method, a procedure that predates the traditional method, is still used in a few places for the production of sparkling wine. The best-known example is Limoux Méthode Ancestrale produced in France's Languedoc region. The ancestral method calls for bottling an incompletely fermented and therefore sweet base wine. After the bottle is sealed, the fermentation will continue inside the bottle until the pressure reaches 1–3 atm and 6% to 7% residual sugar remains. In homage to historical practice, the bottle may not

be reopened for disgorging, and a small amount of sediment may remain therein. This unique method, also known as the *méthode rurale*, is also used to produce Bugey Cerdon AOC and Gaillac Mousseux Méthode Gaillaçoise AOC.

Another wine produced using the ancestral method, Clairette de Die Méthode Ancestral AOC, is produced in the Rhône Valley's Pays Diois. To mimic the ancient production technique of submerging the wine in the icy waters of the nearby river, the wine is kept chilled (at around 50°F/10°C) all throughout the fermentation process, which may last up to six months. After a few months of bulk fermentation, the wine is bottled and allowed to continue fermenting while still under refrigeration. Fermentation will end while the wine is still slightly sweet. At this point, the bottles are quickly emptied, and the wine is filtered before being rebottled for sale as Clairette de Die Méthode Ancestral AOC.

Pétillant Naturel: While the term is not officially regulated nor legally defined, sparkling wine produced using the ancestral method (or something similar to it) may be described as *Pétillant Naturel* (a French term that roughly translates as "naturally sparkling"), or *Pét-Nat*. Wine produced in the Pét-Nat style is often lightly sparkling and somewhat rustic. In addition, such wines may be bottled unfiltered, lending a slightly cloudy appearance due to the presence of lees.

CARBONATION

The least expensive method of making a sparkling wine is to inject carbon dioxide directly into a still wine, which is very much like the process for making a carbonated soft drink. Because the carbon dioxide gas is not naturally created molecule-by-molecule through fermentation, it does not integrate as well with the wine. This results in larger, shorter-lived bubbles in the finished product. This method is used only for wines in the lowest price category.