FORTIFIED WINE PRODUCTION

CHAPTER SEVEN

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LEARNING OBJECTIVES

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

- Recall the historical purpose for fortifying wines.
- Discuss how the fortified winemaking process differs from standard table wine production.
- Recognize the differences in the production methods of sweet fortified wines and dry fortified wines.
- Identify the grape varieties commonly used in fortified wines.
- Describe how the solera system works.

Centuries ago, it was discovered that adding brandy to wine helped protect it from spoilage. In fact, it was discovered that wines "fortified" with brandy or other spirits not only lasted longer than unfortified wines but also often evolved in style and improved in quality at the same time. Fortification became standard practice for wines that needed to travel long distances, such as across the oceans to colonial outposts, as well as for wines that could not be kept chilled in a wine cellar. Fortified wines such as Sherry, Port, and Madeira captured a major segment of the world wine trade and were among the most celebrated wines from the sixteenth to the twentieth century.

Although it took a while for scientists to figure out the processes involved, fortification helped preserve wines because it raised the alcohol level of the wine to a point at which spoilage agents, including yeast and bacteria, could not survive. This allowed fortified wines to last much longer than unfortified wines either in the bottle or the barrel, as well as after the container had been opened.

The market for fortified wines declined toward the end of the twentieth century because of changes in consumer tastes away from high levels of alcohol and toward drier wines. While fortified wines no longer command the market share they once did, they are still an important category, and their unique winemaking procedures merit closer examination by wine professionals.

Fortified wines are made in most wine-producing countries. The basic winemaking process is the same as that of unfortified wines, with the added step of fortification. The differences among the numerous fortified wines come from the following:

- The grape varieties used
- The timing of fortification
- The aging regimen applied after fortification

These differences can be considerable.

Quality fortified wines are made in small batches, using traditional procedures that developed over centuries of practice. These wines use specific traditional grape varieties, may be sweet or dry, and often have elaborate procedures for aging in barrels or bottles for extended periods. Port, Sherry, and Madeira are considered the classics, but similar styles of wine are produced in many areas throughout Europe and beyond.

Fortified wines are usually divided into two types, defined by *when* the fortification takes place, which may be either *before* or *after* the wine has finished fermenting on its own. Those that are fortified while fermentation is still going on, such as Port, are sweet. Port, Sherry, and Madeira are considered the classics, but similar styles of wine are produced in many areas throughout Europe and beyond.

This chapter provides a description of the general winemaking procedures for the two basic types of fortified wine. These procedures are replicated by or serve as inspiration to winemakers in many countries. Additional country-specific details about particular

fortified wines may be found in the chapters that follow.

Table 7–1: Fortification Sequence and Wine Styles

FORTIFICATION SEQUENCE AND WINE STYLES		
Wine Style	**Sweet**	**Dry**
Fortification Sequence	Fortified *during* fermentation	Fortified *after* fermentation
Key Example	Port	Fino Sherry

FORTIFICATION DURING FERMENTATION: THE SWEET STYLE

As described in the section on sweet wine production in chapter 5, one of the primary ways to make a sweet wine is to add alcohol to the wine before or while it is still fermenting and still has a significant amount of sugar in it. This practice is known as *mutage*. If the alcohol level is raised above the point where the yeast can survive, this not only stops the fermentation of the remaining sugar but also ensures that the fermentation will not be able to restart at a later time.

The majority of fortified wines are produced in this manner, as this was found to be an ideal method of making a stable sweet wine. The most renowned of these is Port, made in the Douro Valley of Portugal. This method of fortified wine production is practiced in many parts of the world, resulting in a wide range of products.

Table 7–2: Sweet-Style Fortified Wines

SWEET-STYLE FORTIFIED WINES		
Wine	**Country of Production**	**Grape Varieties**
Banyuls	France	Grenache
Commandaria	Cyprus	Xynisteri, Mavro
Madeira (sweeter styles)	Portugal	Malvasia, Boal, Tinta Negra
Madeira (drier styles)	Portugal	Sercial, Verdelho, Tinta Negra
Málaga	Spain	Pedro Ximénez, Muscat
Marsala	Italy	Grillo, Catarratto, Inzolia, and others
Maury	France	Grenache
Mavrodaphne of Patras	Greece	Mavrodaphne
Moscatel de Setúbal	Portugal	Moscatel/Muscat
Muscat de Beaumes-de-Venise	France	Muscat
Muscat de Rivesaltes	France	Muscat
Port	Portugal	Primarily Touriga Nacional, Touriga Franca, Tinta Roriz, Tinta Barroca, and Tinto Cão; however, several other grapes may also be used
Rasteau	France	Grenache
Rutherglen	Australia	Muscat, Topaque (Muscadelle)

BASE WINE PRODUCTION

Many different grape varieties, both red and white, are used for sweet fortified wines. Usually, high sugar levels are desired to make sure the final product is sufficiently sweet. This is not normally a problem in the hot climates where most of these wines are made. Nevertheless, some grapes are late harvested, and others are allowed to dry for a time after picking, before fermentation begins.

The winemaking procedures for the base wines are essentially no different from those for table wines, although some regions follow long-established idiosyncratic practices for the sake of tradition. However, since fermentation is only allowed to proceed for a short period of time, there is less time to extract color and other phenolics from the grape skins; therefore, special methods may be used to extract these components as quickly as possible.

FORTIFICATION

To keep the wine sweet, the base wine's fermentation is stopped by fortification midway through the process. The exact timing of the

alcohol addition depends on the regional style and the producer's goals, but it is usually driven by the falling sugar level. The fortification will typically take place when the remaining sugar level reaches the 8%-12% range.

The fermentation is halted through the addition of a high-alcohol spirit. The alcoholic strength and composition of this spirit varies from region to region. It can be nearly pure alcohol or a more dilute mixture, but nearly all jurisdictions require the use of grape-based spirits (brandy). Enough brandy must be added to raise the alcohol level of the entire barrel or tank of wine high enough to quickly kill all the yeast and stop the fermentation, which is normally 18%-20% for these types of fortified wines. The spirit additive may be completely neutral or may introduce its own aromas and flavors; it may also be sweet itself, raising the overall sugar level.

Figure 7-1: Tawny Port aging in a wine cellar

AGING

Aging regimens vary by region and by style of wine. Most newly fortified wines are left in barrels, large wooden vats, or tanks for some time to allow the components to become thoroughly

integrated. If wooden vessels are used, slow oxygen seepage through the wood permits a degree of oxidation that helps further stabilize the wines. Some styles, such as tawny Port, may spend years aging in wood.

Unlike unfortified wines, the wine is not necessarily coddled in a cool cellar during this period but is sometimes intentionally left to bake in a hot aboveground warehouse. Madeira and Rutherglen Muscat in particular are given this treatment, which removes any heat-unstable compounds from the wine and makes it nearly indestructible.

BLENDING AND BOTTLING

After a few months to several years of aging in large containers, the wines are blended for style and then bottled. The blends may be formulated in order to re-create a specific, consistent flavor profile for a branded wine, or they may incorporate older vintages for wines that are sold based on average age. They may continue to age in the bottle for several more years before release and, in many cases, may last for several more decades if unopened.

FORTIFICATION AFTER FERMENTATION: THE DRY STYLE

The most well-known fortified wine made in the dry style is Sherry (although not all Sherries are dry). True Sherry is made in the area surrounding the city of Jerez in far southwestern Spain. A similar style of wine is produced in the Montilla-Moriles DO, also in southern Spain. The drier forms of Madeira and Marsala are closer in style to post-fermentation fortified wines than to sweet-style fortified wines in terms of process, although they may be subsequently sweetened.

BASE WINE PRODUCTION

Because the dominant aroma and flavor characteristics of these wines come from the production process rather than the grape

varieties themselves, relatively neutral white grapes are most appropriate. For Sherry, this means primarily Palomino and, secondarily, Pedro Ximénez. Madeira's dry fermented wines are made from Sercial or Verdelho. In other regions, any available grapes may be used, but those serious about making a wine in the Sherry style most often use Palomino.

To avoid extracting more phenolics than necessary, the grapes are handled delicately, not unlike those destined for sparkling wines. After careful pressing, the must is fermented at a warm temperature, high enough to evaporate most of the floral and fruit aromas but not so high as to introduce any "cooked" aromas. To keep the wine neutral in flavor, stainless steel tanks are the typical fermentation vessels used.

FORTIFICATION

The dry-style wines go through a complete fermentation to dryness (or nearly so) before being fortified. For the production of Sherry, there are two basic types of wine, *fino* and *oloroso*, with many variations within these two main styles. The degree of fortification depends on the style of wine to be made.

Figure 7–2: Flor yeast in a barrel of fino Sherry

Fino Sherries are pale in color and light-bodied, due to a process known as *biological aging*. Biological aging requires the action of a unique organism known as *flor yeast* during the aging process. Flor yeast floats on the surface of the wine in the barrel, and thrives in a wine that has about 15% alcohol. In this environment, the flor multiplies until it becomes a thick, protective blanket on top of the maturing wine, protecting the wine from oxidation and preventing it from darkening in color. To encourage the development of flor, Sherry winemakers select the best-quality batches of pale, clear, fresh wine to which they add grape spirits mixed with an equal amount of older Sherry in order to bring the overall alcohol level up to 15% to 15.5%, but no higher.

Once fortification has taken place, the flor survives in the presence of oxygen by consuming any remaining sugars and glycerol in the wine, as well as a small amount of alcohol. As a result, these are lighter-bodied wines than those that have not been aged in the presence of flor. The flor also feeds on acetic acid, thereby lowering acid levels in the wine. When all of the sugar is consumed, flor yeast switch to another metabolic phase in which they use oxygen from the atmosphere. In the process, the flor produces chemicals such as acetaldehyde that create a characteristic "flor aroma" often described as "nutty" or "bruised apple."

Under these conditions, the acetaldehyde that is created is not converted to acetic acid, and the protective coating of the flor prohibits direct contact with the air so that no browning occurs. Biological aging, so named because the changes in the wine are largely due to the action of a living organism, results in lower alcohol and acid levels and much higher amounts of acetaldehyde.

Oloroso Sherries are generally produced from base wines that are not considered to have the quality or delicacy to be made into fino. These wines are fortified to 17% to 18% alcohol, which is too high for the development of flor. Without flor, these wines do not build up the high levels of acetaldehyde that characterize finos.

Oloroso Sherries are allowed direct exposure to air in the partially filled barrels of the solera, where they experience *oxidative aging*. During oxidative aging, alcohol and acid levels increase, and the color of the wine deepens. The result is a fuller-bodied, darkened, flavorful wine dominated by oxidative and caramelized aromas. Because water evaporates during oxidative aging, an old oloroso can rise in alcoholic strength to as high as 24%.

MATURATION

Sherry matures in a complex network of barrels known as a *solera system*. While in the solera, young wine is progressively blended together with a series of older, more complex wines. For fino Sherries, new wine is periodically necessary in order to maintain the level of nutrients needed by the flor yeast. The longest that flor may be maintained is six to seven years, although most commercial finos are only aged for two years, the minimum amount of time required by law.

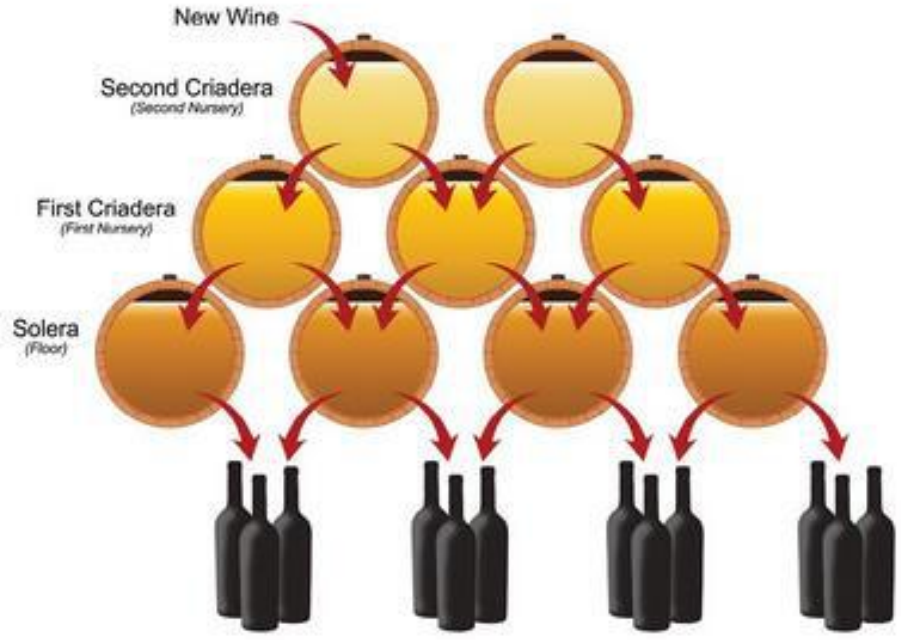

Figure 7–3: Diagram of a solera system

A solera consists of several groups of butts: large (600 L) American

oak barrels. One of the groups, containing the oldest wine, is somewhat confusingly also called the solera. The other groups of butts are called *criaderas* (nurseries). The first criadera holds the next-oldest wine, the second criadera holds the next-oldest wine, and so on. There may be a dozen or more "layers," or criaderas, in a large solera system. The final criadera contains the youngest wine.

The criaderas are usually depicted as multiple rows of barrels with the solera (row) on the bottom and the progressively younger criaderas in the upper rows, but the actual positioning varies by *bodega* (winery). A complete solera system may contain hundreds or thousands of butts, and a large facility may have several soleras in operation simultaneously.

At least once a year after each vintage, wine is bottled from the solera row or one of the criaderas, with no more than 40% of the volume removed each year. This is followed by an intricate process known as *running the scales*. Wine from the first criadera (in theory, an equal amount from each butt within the criadera) is used to top up the barrels of the solera row, wine from the second criadera tops up the first criadera, and so on. Finally, the new wine of the vintage goes into the last (youngest) criadera.

This is known as a *fractional blending* system, and, because no barrel is ever completely emptied, it ensures that the average age of the solera continues to grow. Even for the oldest Sherry soleras—many are over one hundred years old—a tiny proportion of the wine from the year the solera was established remains in the mix today.

Soleras are not unique to Sherry or even to Sherry-style wines. Wines from other parts of the world—including Montilla-Moriles (Spain), Madeira (Portugal), Mavrodaphne of Patras (Greece), and Rutherglen (Australia)—may use a form of solera aging.

Figure 7–4: A solera in use

BLENDING, ADJUSTMENTS, AND BOTTLING

Prior to bottling, Sherry-style wines can be sweetened, colored, or both to produce a wide range of different styles. For wines coming out of a solera, blending is not necessary because they have already been well blended from running the scales many times; nevertheless, some bodegas may blend wines from two or more soleras together, or several wines of different styles together into a single wine.

VIN DOUX NATUREL

Vins doux naturels are lightly fortified sweet wines produced throughout the South of France. Vins doux naturels, depending on local regulations, may be made from either white or red grapes and in many styles, including white, red, and rosé. Aged versions known by terms such as *tawny* and *amber* are also produced in certain regions. Specific examples include Muscat de Beaumes-de-Venise (from the Rhône Valley), as well as Muscat de Rivesaltes, Banyuls, and Maury (all from Roussillon).

MISTELLE

Taking the method to the extreme, it is possible to fortify grape must before—or just slightly after—it begins to ferment. A wine made in this style is known in France as a *mistelle*. In Spain, this type of fortified wine goes by the name *mistela* (when the must is unfermented) or *vino licor* (when a small amount of fermentation is allowed). The term *sifone* is used in Italy, where a version is used to sweeten
some styles of Marsala.

France produces several well-known examples of mistelle, including Pineau de Charentes AOC and Floc de Gascogne AOC. Pineau de Charentes, produced in the Cognac region, is usually produced from Ugni Blanc, Folle Blanche, and Colombard, and is fortified with Cognac. Other grapes are permitted, including some red varieties used for red and rosé versions. Floc de Gascogne, produced in the Armagnac region, is most often produced in a white version (using mainly the Colombard, Gros Manseng, and Ugni Blanc varieties); a small amount of rosé is produced as well.

Wines such as these may be, and often are, referred to as *vins de liqueurs*. However, the European Union recently changed the definition of "vin de liqueur" to include all fortified wines, so the more specific terms—as discussed above—are considered to be more accurate.