

## The Production of Champagne - From the Harvest to Bottling

In order to preserve the status of Champagne as a luxury and high quality wine, the production process has become highly regulated by the Comité Interprofessionnel du Vin de Champagne (CIVC). Whilst some of the rules may seem restrictive, they still allow the Champagne houses the freedom to create a product with their own unique sense of terroir and personality. In this essay; the harvest and the way in which the date set for picking is decided, the pressing of the grapes, the vinification process and the bottling of the Champagne prior to secondary fermentation shall be discussed, with particular reference to the rules set by the CIVC to govern these processes.

Quality wine production in Champagne is defined by the cool northerly climate, receiving on average just 1,650 hours of sunshine each year, over 20% less than Bordeaux (Ginsburg, 2006, 21). This means that the grapes need an extended period on the vine to achieve full ripeness, but also means that early picking results in a vastly inferior end wine, that could harm the reputation of the whole industry. Thus the CIVC governs the exact date when the Champagne harvest can begin and also the maximum yield per hectare. From the beginning of October the grapes are checked twice weekly across a number of vineyards in all 194 villages to assess sugar and acidity levels, the cluster weight, the degree of veraison and for any signs of botrytis. Thus armed with this information, the CIVC sets the opening date for the harvest for each village and each of the three grape varieties. A testament to how seriously this is taken is the fact that the date can even vary depending upon the rootstock used. The grapes are then picked by hand in whole bunches to allow better sorting of healthy and unhealthy grapes, and to avoid bruising or damaging the grapes that can cause oxidation or uncontrolled maceration. The whole bunches are placed in crates that hold a maximum of 50kg to prevent the grapes being crushed under their own weight, and are transported to be pressed as quickly as possible.

As the manner of pressing is another area that can greatly affect the quality of the final Champagne, it is also tightly regulated with the CIVC determining the type and size of press used, the way in which the press is loaded and the maximum permitted yield from the pressing. Traditionally in Champagne a vertical press has been used with a capacity of 4000kg of grapes, known as a marc. The vertical press allows the pressure to be very carefully controlled and evenly distributed, the juice released from the grapes filters through the pomace and requires less settling afterwards, however it is quite labour demanding and the pomace must be loosened several times to ensure that the grapes are evenly pressed. Champagne houses often use pneumatic presses of varying capacity as these press the grapes more quickly and require less labour to operate. Crucially however, only presses that have been certified for the production of Champagne may be used and must have a capacity of 2000, 4000, 8000 or 12,000 kilograms, the press must be loaded from a low height to prevent bruising and maceration and the pressing process can last no longer than 4 hours to prevent oxidation.

The ideal juice for making quality Champagne is high in sugar, tartaric and malic acids with low levels of potassium and tannin, and is found in the middle of the grape, the flesh nearer the skin and the seeds have higher levels of tannin and potassium and can have lower levels of sugar and tartaric acid and are thus less desirable. Therefore the juice or must that is pressed is separated into two components, cuvee and taille. A marc (4000kg) can release no more than 2550 litres of juice, anything else that is extracted (called rebeche) cannot be used for the production of Champagne, but must be sent for distillation. It is important that the pressure applied to the grapes is gentle in order that a minimum of the courser phenolic compounds found in the skin and the seeds are released into the juice. The cuvee is usually obtained in less than two hours and does not require much pressure or manipulation of the grapes, whereas the remaining 500 litres of taille takes on average another hour and a half to extract and greater manipulation of the grapes is required. The musts are then treated with a small amount of sulphur dioxide to protect them from oxidation and are pumped into settling tanks for between 12 and 24 hours. This is vital to allow the precipitation of solid residues, micro-organisms and unstable colloids and can be assisted by the addition of enzymes. This precipitation can account for between 1 and 4% of the total juice pressed, though this is taken into consideration, so a pressing with an expected 2% loss to lees settling will actually consist of 2601 litres in order to give a final total of 2550 litres. The deposits left over from this settling are sent along with the rebeche for distillation, and any water used for cleaning is treated to avoid polluting the environment. The

winemaker must be careful not to clarify the must too stringently however, as this will rob the final wine of any of its character

The must is then sent from the press in tankers to the Champagne houses for vinification. Upon arrival in the fermentation cellar, the musts are analysed for sugar level, acidity level and pH, and tasted by the winemakers to determine the characteristics. The musts are grouped by village and cru, and fermented in either inert containers (steel or concrete), or in traditional oak containers depending upon the house style. As most producers have already treated the must with sulphur dioxide cultivated yeasts have to be used for fermentation, a process that can last between one and two weeks. For every 1 degree of alcohol attained during secondary fermentation, 16.5 grams of sugar per liter are required, thus to attain the usual level of 11% abv of the still wine following first fermentation, the must has a sugar concentration of 181.5 g per liter. In some years where the grapes struggle to ripen fully houses may chaptalise to attain this potential level of alcohol. Fermentation occurs at a temperature between 16 and 20 degrees celcius in order to preserve the freshness and finesse of the wines, though fermentation in oak can occur at much higher temperatures, between 28 and 30 degrees celcius, imparting a completely different character upon the wine. At this point a winemaker may choose to allow some or all of the wine to undergo malolactic fermentation, depending upon the style of Champagne desired.

Malolactic fermentation is the conversion of malic acid, which contains two hydroxide groups to lactic acid which contains only one, thus lowering the overall acidity of the wine, softening the fruit flavours and giving it a rounder fuller mouth feel. Malolactic fermentation is achieved through the cultivation of selected bacteria at a temperature of between 18 and 20 degrees celcius, the by-products of the fermentation are carbon dioxide and diacetyl which gives off aromas of hazelnut and buttered popcorn. The wine is monitored weekly to assess the acidity levels by chromatography, malolactic fermentation generally takes around 3 weeks before the acidity is stabilized in the wine. If a winemaker wishes to avoid malolactic fermentation taking place, it can be prevented by keeping the wine at low temperatures and using sulphur dioxide to kill any environmental bacteria. After undergoing malolactic fermentation or if not undertaken after alcoholic fermentation, the wines are racked, allowed to settle so that the yeasts and any other suspended particles sink to the bottom of the tank and then the wine pumped out from above the lees, and fined through the addition of tannin and gelatin or bentonite. These agglomerate with any colloids that have not been eliminated by racking and sink to the bottom of tank before a final racking is carried out, alternatively fining can be carried out by centrifugal separation, however this is far less common.

The most important stage in ensuring a consistent house style of Champagne now occurs, the blending of the cuvee. This is very much an art form, as the range of blending possibilities are huge. There are the three grape varieties; Chardonnay, Pinot Noir and Pinot Meunier, and they can come from any one of the 319 crus spread across 4 different regions. Each of these regions, the Montagne de Reims, the Vallee de la Marne, the Cote des Blancs and the Cote des Bar has different topography and microclimate which is expressed to a greater or lesser extent by each of the crus. These are rated on a percentage scale according to the suitability for viticulture and there are 17 Grand Crus (rated 100%) representing 14% of the total appellation, 42 Grand Crus (rated between 90 and 99%) representing 18% of total appellation area and 260 Crus (rated between 80 and 89%) that represents the remaining 68% of the total appellation area. To further enhance the range options, the cellar master can choose from wines fermented from either the Cuvee or Taille, and will use a proportion of reserve wine, which has been purposely held back from previous good vintages to improve the quality of wines from lesser vintages, and to ensure that the house is able to deliver a consistent style of non-vintage champagne year after year. If the decision has been made to make a vintage champagne, the cellar master must blend only wines from the current year in order to achieve a final product that will reflect not only the house style, but also the characteristics of that particular vintage. To complicate matters further, the base wine the cellar master creates will taste substantially different once the process of secondary fermentation has been completed, thus they must rely upon their experience of previous blends in order to best predict how the Champagne will taste after several years of maturation. After

weeks of tests and tastings, a final blend is settled upon, and the wine is ready to undergo secondary fermentation.

Before it can be bottled, the wine must be cold stabilised, where it is chilled to minus 3 or 4 degrees celcius in order to precipitate the formation of tartrates, clear crystals that can cause a Champagne to froth violently if they are present when it is opened following secondary fermentation, and then filtered so that the wine is perfectly clear and bright. The wine is bottled, but before it is sealed the liqueur de tirage is added, a small amount of the final blended wine, with 24 grams of sugar and a specially selected strain of yeast, usually *saccharomyces cerevisiae*. The sugar converted by the secondary fermentation into alcohol will result in a final percentage of alcohol of between 12% and 12.5% and a pressure inside the bottle of approximately 6 bars. The bottles are then sealed with a plastic bidule and a crown cap, or a natural cork, and placed on their side in the cellars. After a couple of days, secondary fermentation begins and sparkling Champagne is born.

Thus we see the care that is taken throughout the entire Champagne production process, the labour intensive hand picking and sorting of the grapes in the vineyard, the attention paid to prevent the must becoming oxidised, the stringent rules to limit the yield in the vineyard and the yield of juice that may be obtained by pressing. This all results in the creation of a truly high quality and hand crafted wine, deserving of its status as a luxury and allows for the protection of Champagne as a brand.

Ginsburg, D. (2006) *The Art and Business of Champagne*, McFarland and Company, North Carolina.