Chapter 3A
Sparkling Wines and Yeast Autolysis

Adolfo J. Martínez-Rodríguez and Encarnación Pueyo

Contents

3A.1 Introduction ........................................................................... 61
3A.2 Elaboration of Sparkling Wines .................................................. 61
   3A.2.1 Steps in the Elaboration of a Sparkling Wine by the Traditional Method ........................................... 62
3A.3 Foaming Properties ................................................................... 64
3A.4 General Features of Autolysis .................................................... 67
   3A.4.1 Breakdown of the Yeast Cell Wall During Autolysis ............... 68
   3A.4.2 Products Released by Yeast into Wine During Autolysis .......... 70
   3A.4.3 Autolysis in the Winemaking Industry .................................. 73
3A.5 Conclusions ............................................................................. 74
References .................................................................................... 75

3A.1 Introduction

Sparkling wines are among several wine types that require special production methods. These wines have an additional value and are highly esteemed worldwide. Their most important characteristic is that they effervesce over the entire tasting process. The sparkling properties of these wines, and other sensorial properties, largely depend on the process of autolysis occurring during their manufacture, which takes place because these wines age for a given time in the presence of yeast lees.

3A.2 Elaboration of Sparkling Wines

A sparkling wine is a wine obtained by secondary fermentation of a still wine, called a base wine. When the bottle is uncorked, the sparkling wine gives off carbon dioxide that is exclusively produced by this fermentation (endogenous).
Depending on the production process, sparkling wines can be classified into sparkling wines fermented in the bottle and sparkling wines fermented in large cuves or “granvas”. For the wines fermented in large containers, the second fermentation is carried out in hermetically sealed tanks and later transferred to bottles to be sold, after having spent a minimum of 20 days in the presence of yeasts. Many Italian sparkling wines are made by this method, including some very well-known types such as Lambrusco and Asti. For sparkling wines fermented in bottles, at the end of the production process the wine can be filtered and transferred to another bottle “transfer method”, or the entire production and aging process can be carried out in the bottle itself. This latter technique is referred to as the classical or traditional method.

Wines produced by the traditional method include some of the Italian sparkling wines, such as the highest quality ones called “Talento”, “Cava” wines made in Spain and Champagnes in France; in the latter case these wines are said to be made by the Champenoise method. The greatest differences between these types of wines are mainly the varieties of grape used to make the base wines, the production zones (geographical areas) and the length of time they are kept with the yeasts. Each of these is regulated by its own legislation, which governs these aspects and also certain physico-chemical parameters that must remain within certain specified intervals (CO₂ pressure, alcoholic degree, SO₂ concentration, etc.) (Ough 1992; Hidalgo 2003).

### 3A.2.1 Steps in the Elaboration of a Sparkling Wine by the Traditional Method

#### 3A.2.1.1 Tirage

Tirage involves filling the bottle with the base wine (wine from the first fermentation, produced by the usual techniques of white wine production), monovarietal or made from a mixture of wines (in both cases the grape varieties used are appropriate for this type of production) and the addition of a solution called tirage liquor.

The base wine should present certain organoleptic (pale colour, fruity aroma, etc.) and analytical characteristics (sufficient concentration of oxygen for yeast growth, low residual sugar contents, moderate alcohol contents and low volatile acidity). It should have no residual yeasts, or bacteria, and will usually have been subjected to tartaric stabilization. After being introduced into the bottle it does not undergo any further treatment. The bottles are then closed with a temporary crown cap.

The tirage liquor is a solution formed by the yeasts responsible for the second fermentation, saccharose, grape must, corrected or not, or partially fermented grape must, in the correct proportions to produce the desired pressure of carbon dioxide. Moreover, a small amount of bentonite is usually added in order to facilitate floculation, followed by removal of the lees. The amount of bentonite used is around 3g/hL (Martínez-Rodríguez and Polo 2003).