Tartrates

The general term used by wine-makers to describe the harmless crystalline deposits that separate from wines during fermentation and ageing. In English the substances are also called argols, in French tartres and in German Weinstein or ‘wine stones'. The principal component of this deposit is potassium acid tartrate, the potassium salt of tartaric acid, which has therefore given rise to the name. Small amounts of pulp debris, dead yeast cells, precipitated phenolic materials such as tannins and pigmented tannins, and traces of other materials make up the impurities contaminating the potassium acid tartrate (see sediment).

The lees, the thick layer of dead yeast and grape skins, seeds, and pulp fragments that sinks to the bottom of the fermentation vessel during the later stages of fermentation as deposit, contains lower concentrations of tartrates than do the crystalline deposits that form on the walls of the vessel. Lees are a commercial source of tartrates, but extraction and purification of potassium acid tartrate from lees is much more expensive and time consuming than from the crystalline deposits on walls, the preferred source for commercial tartrates.

The main forms of tartrates used commercially are pure crystalline tartaric acid used as an acidulant in non-alcoholic drinks and foods; cream of tartar (pure potassium acid tartrate) used in baking; and Rochelle salt (potassium sodium tartrate) used mainly in electroplating solutions. The wine industry is the only source of tartrates available to commerce and the crystalline encrustations left inside fermentation vessels are therefore regularly scraped off for eventual commercial use after purification.

Tartrates separate from new wines because potassium acid tartrate is less soluble in solutions of alcohol and water such as wine than it is in plain water, or grape juice. The exact figures for wines vary slightly according to grape variety and region, but experience shows that about a half of the tartrate soluble in grape juice is insoluble in wine. The problem is that the tartrate may remain in a supersaturated state in the complex wine mixture only to crystallize at some unpredictable later time.

Only the most informed consumers appreciate the harmlessness of tartrate crystals in bottle. Although tartrates precipitated in red wines usually take on some red or brown colouring from adsorbed wine pigments and are commonly regarded as mere sediment, in white wines they can look alarmingly like shards of glass to the uninitiated. The modern wine industry has in the main decided that tartrate stabilization is preferable to consumer education.

Tartrate instability was recognized as a problem only in the 19th century when, with greater wine production and standardization of bottle (see bottles) production, bottle-aged wines first became common. Previously wines were not expected to be perfectly clear and many would routinely be strained, but producers of most modern wines, and all inexpensive white wines, believe that their customers expect a brilliantly clear liquid to emerge from the bottle, no matter how long it has been there.

With the efficient degrees of filtration possible today, it is relatively easy to ensure perfect clarity immediately prior to bottling. The problem is to ensure that the wine will remain clear. Historically, wines were stabilized against tartrate precipitation by letting the cellar cool to temperatures near or below freezing during the winter. Low temperatures for three to four months would usually remove so much potassium acid tartrate that further precipitation was unlikely. The modern equivalent is to use refrigeration to chill the wine before bottling to between -5 and -10 ° C/24 to 14 ° F for two to three weeks. Precipitated tartrate crystals are then filtered from the cold wine before it is warmed back to cellar temperature. Sometimes small amounts of finely divided charcoal or bentonite clay are mixed into the wine to be chilled to act as nucleation centres for the supersaturated potassium acid tartrate and therefore induce crystal formation. A more recent and faster technique involves the stirring up of finely ground potassium acid tartrate in the wine, which is then cooled to a low temperature and the cold wine and crystal mixture immediately filtered. This method depends on the rapid crystallization of tartrates from the wine on the millions of fine crystals added that act as nucleation centres. This newer method saves both time and power.

Some everyday wines produced in large quantities contain enough calcium to cause precipitation of calcium tartrate during bottle ageing, although this was most common in the era of the concrete tank. When the concrete tanks were new, or had had their protective coating of tartrates removed, wine dissolved enough calcium carbonate from the concrete surface to cause subsequent calcium tartrate instability. Stainless steel tanks, or lined concrete ones, have largely overcome the problem of calcium tartrate instability.

Tartrates are most commonly encountered in bottles of German wine because, coming from a relatively cool region, they have the greatest concentration of tartaric acid. In white wines colourless, perfectly shaped crystals of potassium acid tartrate are found. In red wines there are usually sufficient adsorbed tannins and pigmented tannins to colour the crystals reddish brown and to ensure that they are small and irregular in shape.