**The Tannins**

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Tannins are organic molecules that form stable combinations with proteins, a process that explains their astringency. They are molecules of high molecular weight, usually between about 500 and 3000 u. The OIV international CODEX for oenological products describes oenological tannin in the following way: ‘Oenological tannin is extracted either from oak gall nut or from a wood rich in tannin, such as chestnut or oak bark, or from grape seeds. The tannin is composed of a mixture of glucosides, either gallic acid and ellagic acid, or catechol’.

**Types of tannins**

In terms of structure, there are two types of tannin:

- **Hydrolysable or pyrogallic tannins.** These are composed of a sugar molecule to which gallic or ellagic acid is bound. Such tannins do not occur naturally in grapes or wine.

- **Condensed or proanthocyanidic tannins.** These are polymers of flavan-3-ol (catechin) and flavan-3,4-diol (leucoanthocyanidin) units. They are the tannins of grapes and wine.

**The origin and extraction of tannins**

**Extraction**

Oenological tannins are usually extracted using water or steam. Although tannins may be extracted with other solvents, ethanol is the only one of these that is authorised today for use in oenology. Other solvents, which are more selective and more expensive, are mainly used for products of pharmaceutical application. Sometimes ethanol may be used to complete the action of steam or water in the extraction of gall nuts.

**Origin**

The tannins that are generally used in oenology are extracted from either gall nuts, derived from oak or terebinth-trees, from exotic or European woods, mainly oak and chestnut-tree, or from fruits like Myrobalans or Tara. In the case of extraction from woods, the type of wood itself is not enough to give a guarantee on the quality of the product. The ‘oenological’ quality of the tannin will vary according to the age of the tree, the part of the tree used, the growing location and the extraction process.

**Characteristics**

The different types of tannins can be distinguished by specific testing methods, and particularly by their UV absorption spectrum. Each also has typical physical and organoleptic characters, including colour, astringency and bitterness (Table 1).

**Role of tannins in oenology**

They are used in oenology for their tannic properties that are an outcome of their chemical characteristics. The appellation ‘red wine tannin’ or ‘white wine tannin’ has no real scientific basis, and the choice of which tannin to use has rather to be based on the purpose of the treatment.

A **antiseptic role**

Tannins have long been known to have bactericidal action. An example of this is the addition of tannin to grapes, and the use of tannins at tirage bottling of Champagne wine, prior to ‘prise de mousse’. In fact, it would seem that the lactic acid bacteria, whose walls are formed from glycoproteins, are more sensitive to tannins than the acetic acid bacteria, which have a wall composed of lipids. While condensed tannins lose their bactericidal activity with an increase in polymerisation and, therefore, with oxidation, the hydrolysable tannins maintain that activity.

A **anti-oxidative agent**

Due to their ability to trap free radicals, tannins play an anti-oxidative role. Their presence in wine increases the wine’s resistance to oxidation. Ellagic acid and gallic acid tannins give better protection than proanthocyanidin-based tannins.

**Elimination of proteins**

There is widespread use of tannin to help with precipitation, either to avoid overfining particularly when a low charged gelatine is used in white wines, or to inhibit laccase in a botrytised harvest.

**Stabilisation of anthocyanins**

When grapes lack maturity, or the maceration time is short, or the harvest is botrytised, the addition of tannin, especially

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**Table 1. Characteristics of the different types of tannins.**

<table>
<thead>
<tr>
<th>Type</th>
<th>Colour</th>
<th>Odour</th>
<th>Astringency</th>
<th>Bitterness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallic acid</td>
<td>White to light</td>
<td>Neutral, sometimes solvent-like</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>tannins</td>
<td>yellow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ellagic acid</td>
<td>Light to dark</td>
<td>Wood-like</td>
<td>++ to +++</td>
<td>++ to +++</td>
</tr>
<tr>
<td>tannins</td>
<td>brown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proanthocyanidin</td>
<td>Brown or dark</td>
<td>Depends upon the raw material</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>tannins</td>
<td>red</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
condensed tannin, improves the structure of the wine and leads to the formation of stable reaction products with anthocyanins.

Role of anti-reduction agent
Hydrolysable tannins have the particular property of forming peroxides in wines. The peroxides oxidise low molecular weight compounds possessing a thiol group such as dimethyl sulphide, ethanethiol or methanethiol (the S-H bond is 40-fold less stable than C-H bond).

Effect on wine structure
Tannins play a major role in the structure and body of wines, and this is one of the key factors involved in ageing and conservation.

Iron complexation
Between pH 3 and pH 5, ferric iron reacts with tannins to give a blue-black precipitate. This leads to a partially soluble combination with the ellagitannins. This action may be combined with a treatment involving calcium phytate. In practical terms, it is best to prepare tannins in a non-metallic container.

Use of tannins
Some properties and use of tannins in oenology are indicated in Table 2.

Gallic tannin
This tannin is essentially used in white wines since it has little effect on the wine’s colour. It may be used in the following ways and at the addition rates indicated:

- To eliminate slight protein problems and improve structure (at 5–10 g/hL)
- In a botrytised harvest, it reinforces the inhibition of laccase (at 5–10 g/hL)
- To eliminate off smells in clear wine when followed by aeration (3–5 g/hL)
- In tirage bottling of sparkling wines (3–5 g/hL).

Proanthocyanidic tannins
This tannin is used more in red wines. It may be used in the following ways and at the addition rates indicated:

- In a botrytised harvest, it inhibits laccase and stabilises anthocyanins (at 15–50 g/hL)
- It stabilises colour (in one or more treatments) in fruit with poor maturity if from an otherwise healthy harvest (at 10–30 g/hL).

Ellagic tannin (oak wood)
This can be used to restructure white and red wines:

- It improves body and structure (at 5–20 g/hL)
- It removes the risk of an off smell during ageing (at 3–5 g/hL)
- It allows nurturing in vats on lees.

Ellagic tannin (chestnut wood)
This is usually used in white wines:

- Improves fining and prevents overfining (at 5–15 g/hL)
- Blocks slight (3–5 mg) iron excess (at 3–10 g/hL).

Table 2. Examples of some properties and uses of tannins in oenology that are in addition to the classical properties of oenological tannins (i.e. to ease clarification and fining). In all cases, after adding tannins, it is recommended to rack off as usual until fining.

<table>
<thead>
<tr>
<th>Name</th>
<th>Composition</th>
<th>Properties</th>
<th>Use</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanin galalcool</td>
<td>Gallic tannin</td>
<td>Complexing oxidisable molecules, moderately active in proteins</td>
<td>Eliminates slight proteinic disturbance</td>
<td>5–10 g/hL</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Tirage bottling of sparkling wines</td>
<td>2–4 g/hL</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Eliminates reduction smells</td>
<td>3–5 g/hL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In botrytised harvests</td>
<td>5–10 g/hL</td>
</tr>
<tr>
<td>Tanin vr supra</td>
<td>Catechic tannin</td>
<td>Very active molecules on proteins; combine with anthocyanins</td>
<td>Stabilises colour</td>
<td>10–30 g/hL</td>
</tr>
<tr>
<td></td>
<td>Ellagic tannin</td>
<td></td>
<td>Inhibits laccase and stabilises</td>
<td>15–50 g/hL</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>anthocyanins if grapes very</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>deteriorated</td>
<td></td>
</tr>
<tr>
<td>Queratanin</td>
<td>Ellagic tannin</td>
<td>Highly complexing, oxidisable molecules; slightly active on proteins</td>
<td>Improves body and structure</td>
<td>5–20 g/hL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eliminates off smells in wines</td>
<td>3–5 g/hL</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>kept in tanks</td>
<td></td>
</tr>
<tr>
<td>Oenological tanin</td>
<td>Ellagic tannin</td>
<td>Highly complexing, oxidisable molecules; slightly active on proteins</td>
<td>Improves fining</td>
<td>5–15 g/hL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blocks slight iron excess</td>
<td>3–10 g/hL</td>
</tr>
</tbody>
</table>