



Gelatine, casein and potassium caseinate as distinct wine fining agents: Different effects on color, phenolic compounds and sensory characteristics

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- The main proteinaceous fining agents used in wine are: gelatin, casein, potassium caseinate, egg albumin and isinglass. The name “gelatin” includes a great diversity of products -all deriving from animal collagen- which vary widely depending on the type of hydrolysis used in their manufacture. If the hydrolysis is *enzymatic*, the resulting gelatins have low molecular weights (lower than 13.7 kDa); if the hydrolysis is *chemical* (alkaline or acid), the resulting gelatins have larger molecular weights depending, in turn, on the temperature and time used in the process.
- Wine phenols interact with proteinaceous fining agents through 2 main types of interactions: *hydrogen bonding* and *hydrophobic interactions*. These interactions lead to the formation of aggregates that tend to precipitate overtime, thus removing specific phenolic compounds from the wine –reducing astringency or bitterness in the process.
- Not only do the different fining agents combine preferentially with different phenolic compounds, but not all phenolic compounds contribute to wine astringency in the same way. It is believed that **astringency is mainly due to more polymerized tannins and those tannins that are esterified with gallic acid**. Of all the proteinaceous fining agents, gelatin and casein have been shown to interact more intensely with these two fractions. The goal of this study was to better understand the role of gelatin and casein on color, phenolic compounds and sensory characteristics of both red and white wines.
- The authors compared 4 fining agents: 1) a low molecular weight liquid gelatin, 2) a high molecular weight solid gelatin, 3) casein, and 4) potassium caseinate. They characterized the molecular weight distribution of these fining agents using gel electrophoresis, and obtained the following results (all of them had a slight acidic, or almost neutral, pH):

	<i>Molecular weight</i>	<i>Working concentration</i>	
		<i>Whites</i>	<i>Reds</i>
1) Liquid gelatin	< 43 kilodaltons	5 mL/hL	6 mL/hL
2) Solid gelatin	> 43 kilodaltons	8 g/hL	10 g/hL
3) Casein	30 kilodaltons	15 g/hL	15 g/hL
4) Potassium caseinate	30 kilodaltons	20 g/hL	20 g/hL

The authors used 2003 wines elaborated from a blend of varieties - not specified in the text- from the Portuguese Obidos (whites) and Lisbon (reds) regions. The fining trials were conducted in the lab using 1 liter of wine, allowing the fining agents 7 days of contact with the wine. The fined wines were then analyzed using high pressure liquid chromatography (HPLC) to separate their flavanol content into 3 fractions according to degree of polymerization: monomers, oligomers and polymers. Wine color was analyzed using CIELab parameters. Let's see the results.

• **White wine fining trial results.** As a reminder, the goal of the study is to determine which tannin fraction (monomeric, oligomeric, or polymeric flavanols) is more depleted after adding different fining agents. Results are presented in the following table:

Fining agent most effective on:	Is:
Monomeric flavanols	Casein
Oligomeric flavanols	Solid gelatin, casein
Polymeric flavanols	Liquid gelatin
Non-flavanols	Both gelatins
Increasing lightness, L* (clarifying action)	Liquid gelatin
Decreasing yellowness, b* (decolorizing action)	Liquid gelatin, casein

• **Red wine fining trial results.** Results for red wines were similar, although the authors studied the fractions affected in more detail, as follows:

Fining agent most effective on:	Is:
Monomeric flavanols (catechin, epicatechin)	Casein, K caseinate
Oligomeric and polymeric flavanols	Liquid gelatin
Colored anthocyanins	Liquid gelatin
Polymeric pigments (anthocyanins combined with tannins)	Liquid gelatin
Color intensity	Liquid gelatin
Color hue	Not affected
Increasing lightness, L* (clarifying action)	Liquid gelatin
Decreasing redness, a* (color loss)	Liquid gelatin

• **Sensory evaluation.** The fined wines were assessed by a panel of 9 trained judges for several general descriptors (clarity, color, aromatic intensity and quality, taste intensity and quality, fullness, global appreciation) using a 0-4 scale (for color) and a 1-7 scale (for the remaining attributes). The authors do not mention whether these sensory evaluations were replicated.

	Fining agent producing the highest:	Is:
WHITES	Color, clarity	Liquid gelatin
	Aroma intensity	Solid gelatin
	Fullness, global appreciation	Casein, K caseinate
REDS	Color, aroma intensity	Casein
	Aroma quality, astringency, global appreciation	Liquid gelatin

In summary, casein tended to deplete the monomeric and oligomeric components more, whereas gelatin, particularly the lower molecular weight liquid gelatin, depleted the polymeric components more. Red color was not highly affected by the type of fining agent used, but liquid gelatin diminished it more than the other agents tested.

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