



“Influence of fining with different molecular weight gelatins on proanthocyanidin composition and perception of wines”

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Understanding the mechanisms by which proteins react with tannins can lead to more efficient fining trials. The authors compare three types of gelatins and evaluate what type of phenolic material is precipitated by each, and the effect on the taste of the resulting wines.

- The authors compared **3 gelatins**: 1) Gelisol, a commercial liquid gelatin with average molecular weight (MW) of 25,000 daltons, 2) a gelatin fraction of MW 16,000 daltons (G16), and 3) a gelatin fraction of MW 190,000 (G190). (The two latter were obtained from the commercial Gelisol by using a column chromatography to separate the different size fractions). The authors further characterized these three gelatins by determining their *protein content* (Kjeldahl method) and their *amino acid composition* (acid hydrolysis followed by HPLC). All gelatins had similar amino acid composition, confirming that they only differed in their molecular weight.

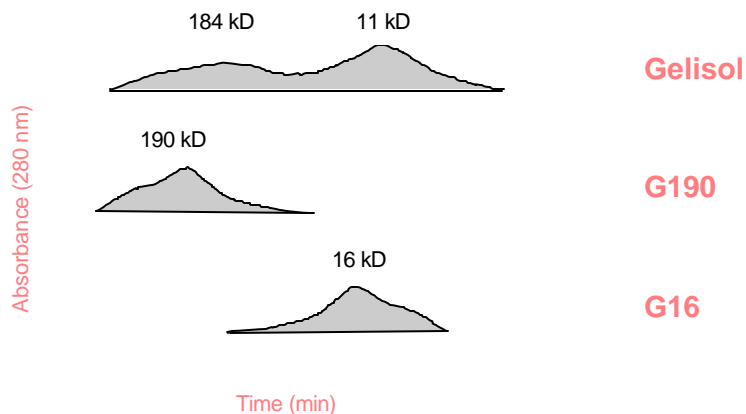


Diagram by the authors

- The authors treated **4 wines** with varying phenolic composition: 1) a Syrah, 2) a blend 75% Syrah, 25% Grenache, 3) a blend 25% Syrah, 75% Grenache, and 4) a Merlot. We will call them A, B, C, D. All wines were from 1998, except A which was from 1997. Each wine was treated with each of the gelatins at a rate of 0.1 g/l. After incubation (48 hours at 25°C) (72°F), the wines were centrifuged, each yielding a pellet and a supernatant.

- The authors analyzed each pellet and each supernatant for polyphenols, to find out which type of material was precipitated by each gelatin. To do that, they measured the following: 1) monomeric phenols, 2) polymeric proanthocyanidins (condensed tannins) and their subunits (by thiolysis followed by reverse-phase HPLC), 3) degree of polymerization (average number of units in the tannin polymer), and 4) percentage of gallic and epigallocatechin units.

• **Phenolic composition of pellets.** The pellets contain the material that the gelatins removed from the wines. The authors obtained the following results: 1) **Gelatins did not precipitate monomeric phenols, only polymeric phenols** (or condensed tannins) Both molecular weight fractions precipitated the same amount of tannins (about 10% of the initial amounts), whereas Gelisol precipitated a little bit more (16%). As color is mainly due to anthocyanins, this is in agreement with previous reports that gelatin fining does not affect color. It is also in agreement with reports that the molecular weight of the gelatin does not affect the amount of tannin precipitated (provided gelatin concentrations compared to tannin concentrations are low, or protein/tannin ratios are less than 1).

• 2) The degree of polymerization of the tannins in the pellets was higher than that of the tannins in the initial wines. In other words, **gelatins remove mainly larger tannins**. Furthermore, the size of the tannins removed by G16 was significantly higher than the size of the tannins removed by G190. So gelatin molecular weight was important in the type of tannin precipitated, and **the lower molecular weight gelatin was more effective in removing large tannins than the higher molecular weight gelatin**. The Gelisol solution behaved somewhere in between.

• 3) Finally, the proportion of gallic units in the pellets was much higher than in the initial wines. That suggests that the gelatin fining preferentially removed the more “galloylated tannins”, which are those tannins that have gallic units bound. In contrast, the levels of epigallocatechin units in the pellets were found to be the same as in the wines. All of the above findings boil down to the conclusion that **the precipitation of tannins by protein (gelatin) increases with the degree of polymerization and the number of gallic units bound to the tannins**. As the authors discuss, both of these properties are probably related, since higher molecular weight tannins are likely to possess a greater number of gallic units available to interact with the protein.

• **Phenolic composition of supernatants.** The supernatants represent the “fined wines”, after the gelatin was removed. Supernatants showed, as expected, significantly lower amounts of tannins, but only when G16 and Gelisol were used. Treatment with G190 did not significantly modify tannin content. Therefore, only gelatins that included a relatively small molecular weight fraction were useful in decreasing the amount of tannins in the wines studied.

• **Sensory evaluation.** After being trained to distinguish acidity, bitterness, and astringency, 12 volunteer judges were asked to rate “astringency intensity” from 1 to 3, for each of the wines. To avoid fatigue, only wines treated with the two gelatin fractions (G16 and G190) were compared. Also, only wines B and C (Syrah/Grenache blends) were available for tasting at the time. The authors found that, for wine B, the comparison between G16 and G190 did not reveal any difference. In contrast, for wine C, **the wine treated with G16 was perceived as less astringent than that treated with G190**. This is in agreement with the lower amount of tannins measured in wines fined with G16, compared to G190. We also saw that G16 had a preference for larger size tannins. Thus, the author’s data suggest that **larger tannins, which also happen to be the most “galloylated”, are also the most astringent**.

In summary, precipitation of gelatin is selective for highly polymerized and gallic-rich tannins. We saw how a smaller gelatin (MW 16,000) is able to precipitate more polymerized tannins than a larger one (MW 190,000). The smaller gelatin also caused a more effective decrease in astringency compared to the Control. The authors believe that a smaller-size gelatin is probably more flexible and can gain more access to the tannins it wants to react with. So what molecular weight is your gelatin? To find out, check out the manufacturer’s specifications.