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New method for evaluating astringency in red wine

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• As we know, astringency is caused by the ability of some phenolic compounds to bind salivary proteins, producing a drying, puckering sensation in the mouth. Salivary proteins with a high proportion of *proline* and *hydroxyproline* seem to be the major target in this reaction with phenols. The size of the procyanidin (or condensed tannin) molecule also seems to play a role: higher polymerization tends to cause greater astringency. On the other hand, the combination between anthocyanins and procyanidins (to form polymeric pigments) may reduce their capacity to react with salivary proteins and, therefore, reduce astringency.

• Wine astringency is usually estimated by **tasting** –a method subject to individual bias and requiring extensive training. On the other hand, the only analytical method known to the authors to measure astringency is the *gelatin index* – which gives only approximate results due to variations in the acid hydrolysis used to measure tannin, as well as variations in the composition of commercial gelatins. So they felt the time was right for a new, more objective method of quantifying astringency.

• Obviously, the most suitable proteins for measuring astringency would be human salivary proteins themselves- difficult to obtain! So what could be used instead? These authors are proposing **ovalbumin**. Why? Because it is a pure protein –not a mix- and because it is one of the most widespread proteins used for fining red wines. In this paper, the authors propose a method to determine astringency in wines using ovalbumin as a precipitation agent, and tannic acid as the standard. And they validate the method by comparing the results with those of the **Gelatin index** method and with **sensory analysis** performed by a trained panel.

• The authors selected 10 red wines that represented a wide range of astringencies to run the 3 parallel methods. 1) They obtained the wine **gelatin index** by the Glories method. Briefly, tannin is measured by absorbance at 550 nm after acid hydrolysis. Then all the tannin is precipitated with an excess of gelatin, and measured again. The index is a ratio between the two tannin measurements. 2) For the **sensory evaluation**, 10 expert enologists from the Rovira I Virgili University (Spain) evaluated the wine astringency on a scale from 1 (low) to 100 (high). The panel had 2 training sessions in which they were required to agree by consensus on the astringency score of 3 selected wines. 3) For the proposed **ovalbumin method**, they used increasing amounts of tannic acid or wine, and precipitated each tube with increasing concentrations of ovalbumin. Then they determined the tannin concentration in the wine tubes ("unknown") by comparing their absorbance at 280 nm with the absorbance of the tannic acid tubes ("known").

• **Results.**
1) Adding ovalbumin precipitated tannic acid and decreased the supernatant absorbance at 280 nm. The curve obtained was a logarithmic one, with the slope perfectly proportional to the initial concentration of tannic acid in solution. 2) Considerable differences were found between the ranking of the wines according to the sensory data and the ranking according to the gelatin index. The correlation was a little bit better when the gelatin index was expressed as a percentage than when it was expressed as astringency intensity.

3) The best correlation with the sensory data was that of the proposed ovalbumin method. This method also had lower deviations (5.2%) than the gelatin index, meaning higher reproducibility.
4) Sensory estimation of astringency had a very high deviation (25.8%). According to the authors, this was expected given that many well-trained tasters still confuse bitterness and astringency [*then, they are not well-trained!*], or have difficulty distinguishing between them.

* Numbers represent wines 1-10

Diagram by authors

In conclusion, the authors propose a method of measuring astringency - using ovalbumin as the precipitation agent and tannic acid solutions as standards - which is more reproducible than the gelatin index, and correlates better with sensory data. As a reminder, this is strictly a method to estimate astringency. For a detailed method of measuring the species involved, see the Harbertson/Adams Assay (Summaries #27 and 28). As the authors note, no method of measuring astringency can completely substitute for human perception, but the proposed method correlates very well with sensory data and allows for an objective quantification.

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