Chemical and sensory evaluation of astringency in Washington state red wines

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• Tannins are the main class of polyphenolic compounds thought to contribute to astringency. The Harbertson/Adams assay allows for the measurement of the various phenolic fractions in a wine: tannin, large polymeric pigment (LPP), small polymeric pigment (SPP), and anthocyanin (*see Summaries #4 and #28*). The goal of these authors was to explore the relationship between perceived astringency and actual tannin, LPP, SPP and anthocyanin concentrations in Washington State red wines.

• For the **chemical analyses**, wines were selected from a collection that had been previously analyzed for tannin, LPP, SPP, and anthocyanin. Based on the tannin concentrations, the authors classified these wines in 3 groups: "high" (>800 mg/L catechin equivalents), "medium" (400-800 mg/L catechin eauivalents), and "low" (<400 mg/L catechin equivalents).

• For the **sensory analysis**, the authors used 2 types of panels – an untrained and a trained panel. The *untrained panel* consisted of 18 volunteers, recruited from Washington State University (WSU), who currently consume red wine. Prior to the evaluation, the subjects were familiarized with astringency standards. The *trained panel* consisted of 10 volunteers from WSU who were trained over 6 sessions to identify and quantify astringency through the presentation and discussion of astringency *standards*, as well as *wines* of varying astringency levels (including Syrah, Cabernet and Merlot). They were also trained to evaluate bitterness using bitterness standards.

• At this point, the authors mention that the panelists were also trained with wines of varying levels of tannin, LPP, SPP, and anthocyanin [*How do you train panelists to perceive the effect on astringency of various levels of these phenolic fractions when that's exactly what you are trying to find out? Results will definitely be influenced by how this training was conducted. That's why it is important that researchers provide sufficient detail on how this type of training is done*]. Both panelists –trained and untrained- then went on to evaluate 2 replicate flights of 3 coded samples: a low, a medium, and a high tannin wine (A, B, and C, respectively). They rated astringency on a 15-cm unstructured scale, anchored with "not astringent" at 1 cm and "extremely astringent" at 14 cm. (The authors do not mention how bitterness was rated.) Let's see what each panel found.

• **Results of the untrained panel.** This panel rated wines A, B, and C for astringency (as a reminder, wine A had <u>low</u> concentrations of all tannin, LPP, SPP and anthocyanins; wine C had <u>high</u> concentrations of all of these components; while wine B was in between). The astringency ratings of this panel for the high-tannin wine (wine C) were significantly different from those of the low tannin-wine (wine A). However, the panel gave similar ratings to the medium- and the high-tannin wines. There was a significant "judge effect", meaning that the individual panelists may have used different parts of the scale to evaluate astringency.

• **Results of the trained panel.** The **astringency** panel ratings were significantly different between wines A and C, and also between wines A and B, but wine C was not rated differently than wine B. Authors found, once again, a significant "judge effect" - different use of the scale. As we can see, both panels yielded similar results, namely, **significant astringency differences when high- and low- tannin wines were compared, but no differences when medium- and high-tannin wines were compared** For this panel, **bitterness** ratings were also significantly different between wines A and C, but not between wines A and B, or wines B and C.

• The authors note that if insufficient time is allowed between samples (they had allowed 2 min), panelists may confuse lower-astringency wines with higher-astringency wines, given the well-documented issue of *astringency carry-over*. They also note that the **panelists used the scale more consistently when evaluating bitterness than when evaluating astringency**. This makes sense to them, given the numerous nuances in the definition of astringency - drying, puckering, chalky, fine, medium, or coarse – compared to the simpler definition of bitterness.

• **Relationship between sensory and chemical results. 1) Astringency showed a strong positive relationship with, in this order, tannin, SPP, and LPP** (the latter being a pigmented polymer of 4 or more monomeric units). Several previous studies have also reported a strong correlation between perceived astringency and tannin concentration (*see Summary #27*). **2) Bitterness was positively correlated with, in this order, SPP, LPP, and tannin.** The correlation with SPP is supported by a previous study which reported a positive correlation between monomer concentration and bitterness. However, another study reported that bitterness was <u>not </u>affected by degree of polymerization.

To the current authors, this research shows that tannin concentrations may not be the sole factor influencing perceived astringency and that the interaction between tannin and polymeric pigments may play a role. The authors believe the relationship between astringency and small polymeric pigments (SPP) should be further explored with a panel trained to perceive subtle sub-qualities of astringency, such as fine, grainy, dry, or chalky.