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Components of Red Wine Mouthfeel

The following is an outline of a presentation given at Wineries Unlimited, 2004, on wine mouthfeel issues. Additional information on this subject can be found under *Enology Notes*.

The balance of mouthfeel components can be viewed as a wine quality measure. Indeed, balance and harmony are two descriptors used to denote wine quality.

The importance of balance and harmony was certainly highlighted during the 2003 and 2004 grape growing seasons in Virginia.

Palate Balance Equation

Sweet	⇆	Acid	+	Phenolics
Carbohydrates		Organic acids		Skin, seed, and stem phenols
Polysaccharides				Barrel phenols
Ethanol				Enological tannins
				Volatile phenols

Wine structural/textural components interact in certain relationships depicted above, in what I refer to as the palate balance equation

This inverse relationship suggests that an increase in the perception on one side decreases the perception of components on the other. The converse is also true.

With this in mind, it is easy to understand how the specific components of wine mouthfeel interact, and make some important winemaking inferences.

The sweet elements in a dry red wine are derived from carbohydrates, polysaccharides and, mainly, ethanol. The acid elements are grape-derived organic acids. The phenolic elements include input from these components: skin, seeds, and stems, plus winemaker intrusion, such as tannin additions and barrels.

Sweet ⇆ Acid + Phenols (tannin intensity, astringency, bitterness and dry tannins)

The phenolic elements in this relationship include the perceptions derived from the following: tannin intensity, astringency, bitterness and dry tannins, in a relationship well-described by Delteil (2003).

The integration of structure and texture components is of importance because our perceptions occur in **different parts** of the palate and therefore at **different time intervals**, as you know.

Thus, we taste sweetness at the front of the palate first, followed by acidity on the sides, and finally the phenol taste of bitterness and tactile responses near the back.

Yet we expect that in a high quality, well-integrated wine, we will not perceive these separate sensations, but a nice, harmonious whole. The question is, how do we attain that goal of a harmonious structure and texture? Much of this work is from Dominique Delteil, from the ICV.

I. Sweet. In a dry red wine, the sweet elements are frequently not perceived as sweet, due to the impact or balance from the acid and phenolic components.

The primary sweet element in dry red wines is derived from alcohol and polysaccharides. These elements contribute to the perception of body or volume.

Sweet ⇆ Acid and Phenols (tannin intensity, astringency, bitterness and dry tannins)

Sweet/Volume/Body

+ Ethanol

+ Polysaccharides and other sugars (derived from grapes, yeast, bacteria, oak, commercial products and yeast fining)

Glycerol, unknown

- Volatile sulfur-containing compounds (VSCs)

Key: The plus sign (+) indicates a positive correlation, while a negative sign (-) indicates a negative correlation.

Thus, high alcohol wines such as California central coast Syrahs or Amidor County Zinfandels would contain a high concentration of body or volume elements.

We traditionally view volatile sulfur compounds as having mainly an olfactory sensation, which they do. H_2S and the vast array of organic sulfur-containing compounds add to what we call “reductive tone” defect. They also have a major impact on structure, that is as dramatic as their impact on odor.

Volatile sulfur compounds decrease the perception of volume/body, thus increasing the perception of the components on the right hand side of the palate balance equation.
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II. Acidity.

Sweet ⇆ **Acidity** + Phenols (tannin intensity, astringency, bitterness and dry tannins)

- Sugar

+ Tannins

+ Certain volatile sulfur-containing compounds, including herbaceous compounds

- Ripe fruit, spicy aromas

- Polysaccharides (grapes, yeast, bacteria, oak, commercial products)

+/- Body/volume

+ Tannin intensity

+ Dryness

+ Bitterness

Anything which increases the perception of acidity usually increases the perception of the phenolic elements also. This usually includes tannin intensity, astringency, bitterness, and dry tannins.

III. Phenols

The qualitative and quantitative nature of phenols impacts their sensory characteristics**.** By qualitative, I am referring mainly to phenolic polymerization.

Sweet ⇆ Acidity + **Phenols** (**tannin intensity**, astringency, bitterness and dry tannins)

Tannin Intensity

+ Acidity

+ Volume compounds, such as extract

+ Yeast in suspension

- Polysaccharides

+ Volatile sulfur-containing compounds

+ Herbaceous compounds

+ Non-soluble solids

In our trials on the use of microoxygenation, we have seen a reduction in both tannin intensity and astringency, in part, due to the reduction in red wine herbaceousness. One very important point is that high concentrations of yeast and/or bacteria in wine can impact the perception of the wine structure/textural balance, as indicated.

Phenols

Sweet ⇆ Acidity + **Phenols** (tannin intensity, **astringency**, bitterness and dry tannins)

Astringency

+ Grape and oak tannins

+ Acidity

0 Sugar

+ Volatile sulfur-containing compounds and herbaceous compounds

- Alcohol up to 14%, + above 14%.

+ Non-soluble solids

Qualitative change in phenols, due to oxidative polymerization, results in softer tannins, which can reduce the impact from the astringent tannins, lower the perception of the acidity, and increase the perception of volume or body—the sweet elements.

Sweet ⇆ Acidity + **Phenols** (tannin intensity, astringency, bitterness and **dry tannins**)

Dry Tannins

- Alcohol up to 13%, + above 13% (v/v)

0 Sugar

+ Grape and oak tannins, including seed tannins

+ Acids, mainly malic and acetic

+ Volatile sulfur-containing compounds and herbaceous compounds

+ Yeast in suspension

- Polysaccharides

- Non-soluble solids

The fact that dry tannins are not masked by sugar suggests that this common corrective approach is not very effective.

Sweet ⇆ Acidity + **Phenols** (tannin intensity, astringency, **bitterness** and dry tannins)

Bitterness

+ Ethanol

+ Grape and oak tannins, including immature seed tannins

+ Acid, specifically malic acid

+ Volatile sulfur-containing compounds

+ Yeast in suspension

- Polysaccharides

The negative correlation between polysaccharides and bitterness is a reason for the use of high polysaccharide-producing yeast, and the use of agents such as gums, like Gum Arabic, and yeast fining.