Wine Mouthfeel and Texture

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Wine Texture

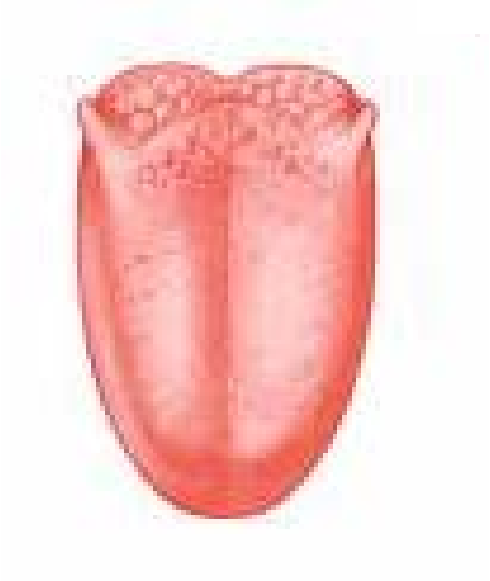
From a quality / character perspective

Wines primarily characterized by ***varietal typicity***: **<u>Color, Aroma, Balance (*Age*)</u>**
Consumer has an expectation of what that wine will be based on the label

Wine texture comes into play immediately, **differentiating quality** (90 pt vs. 80 pt)

Achieving exceptional textural properties of wine can be inherently difficult

Stems from **fruit composition** and **wine production techniques** once off the vine



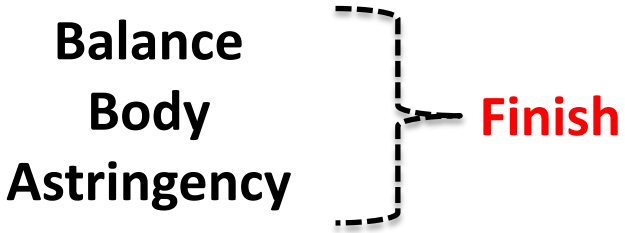
Wine texture – *mouthfeel, body, palette, balance, finish …*

Ideal descriptors: ***Full, Rich, Supple, Smooth, Round, Balanced***

Not so ideal: ***Thin, Limp, Watery, Angular, Harsh, Aggressive, Rough***

Like aroma profiles, not all wines are expected to be *big*, *full* wines
However, they should ***present a pleasing entry into the palette and finish***
Wine texture should **follow the expectations** set by the eyes and nose

I like to break this aspect into **3 basic categories** in my own mind:



There is **interplay between areas** (e.g influence of acidity on astringency or perceived bitterness, influence of alcohol on palette and finish)

Balance

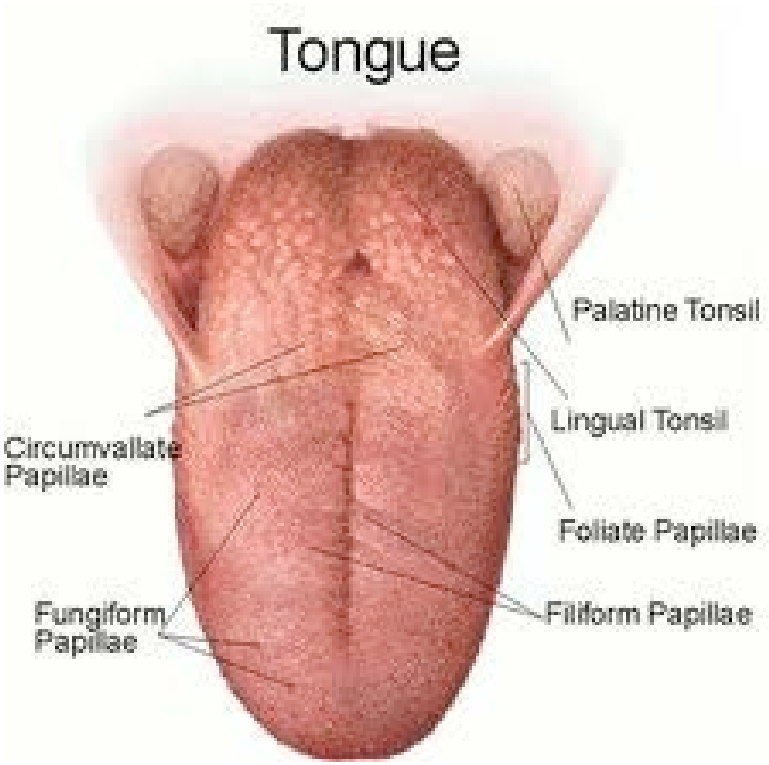
Quite literally- the **balance** between ***sweet and sour*** / ***sugar and acid***

Sweet and Sour are 2 of the **5 tastes** most of us are capable of perceiving

Sweet*, *Salty*, *Sour*, *Bitter*, *Umami

This response is **dictated** by the activity of our **taste buds**, or papillae on the tongue.

Density of papillae on the tongue has been correlated to ones sensitivity to taste perception.



Balance

- A form of **chemoreception**, chemicals interact with the ***receptor proteins*** at the papillae and a signal is transmitted through neurons to the brain.

  - Sweet perception: **0.5 - 5 g/L** (Sucrose)
  - Sour perception: **0.05 - 0.2 g/L** (Tartaric Acid)

- Dry wine:< 5.0 g/L Sugar (< 0.5 %) , 4-6.0 g/L Tartaric Acid

Balance

The importance of balance in a wine (red or white) is to ***compliment the aroma or character.***

Highly acidic wines tend to deliver a ***thin, watery, dry*** perception.

The contribution of **sugars**, even ***very low concentrations*** (***< 0.5%***), can *counteract the acidity* and *build volume* or body to a wine.

Wines out of balance towards low acidity tend to be ***flat, flabby, soft***

Glycerol is also found to balance acidity through the **perceived sweetness**

Not generally thought to provide *viscosity* at concentrations typically found in wine.

Body

The ***Body*** of wine refers more to ***the perception of weight, volume, or viscosity in the mouth.***

There is an obvious **interplay** between ***balance and body***

An acidic wine *can* display considerable body or weight

Sweet wines often exemplify the definition of a **thick or full** wine

Tokay, Sauternes, Trockenbeerenauslese, Ice-wine, Sweet Muscadine…

Aside from sugar, common **contributions to body** come **from *polysaccharides***

- Grape, Yeast, Exogenous -

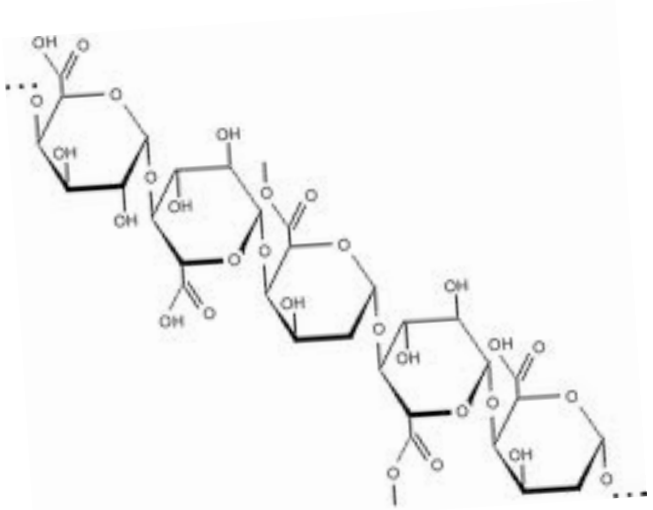
Polysaccharides (colloids) are generally held in solution or suspension

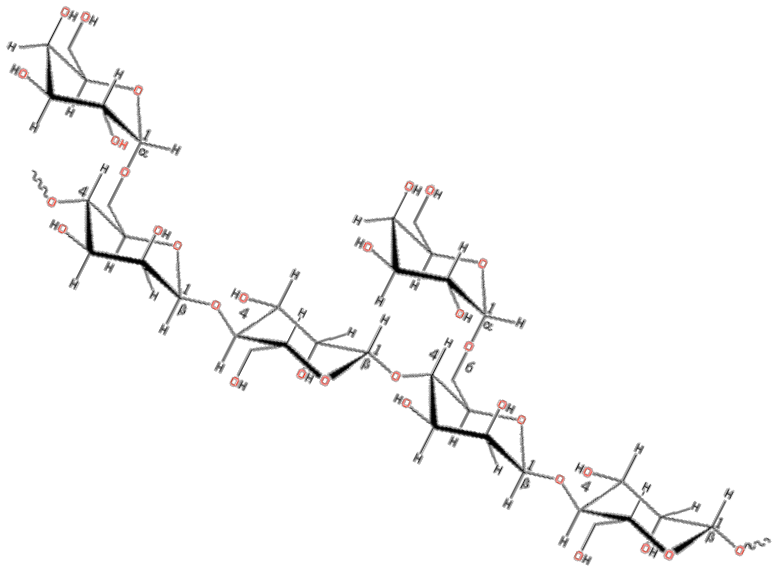
Setting jelly is a visual and textural example of the influence of polysaccharides

Increase the ***viscosity*** and ***perceived thickness*** of wine

Stabilize macromolecules in wine during aging (haze, texture, color, acidity)

Polysaccharides are long-chained sugar polymers (glucose, mannose, arabinose, xylose etc.)





Many of the **soluble polysaccharides** are not digestible by humans / microbes

Remain in solution / suspension, are relatively large, and open to various ***molecular interactions*** (ionic bonding, H+ bonding, hydrophobic interactions).

Interact with phenolics, proteins, and other polysaccharides

Can form '***protective***' colloid stability; can also form precipitates (***haze potential***)

Grape-based polysaccharides come from the skin and mesocarp

May **precipitate** due to the **ethanol** content of wine

Issues with filtration and haze formation (Botryitis infected grapes)

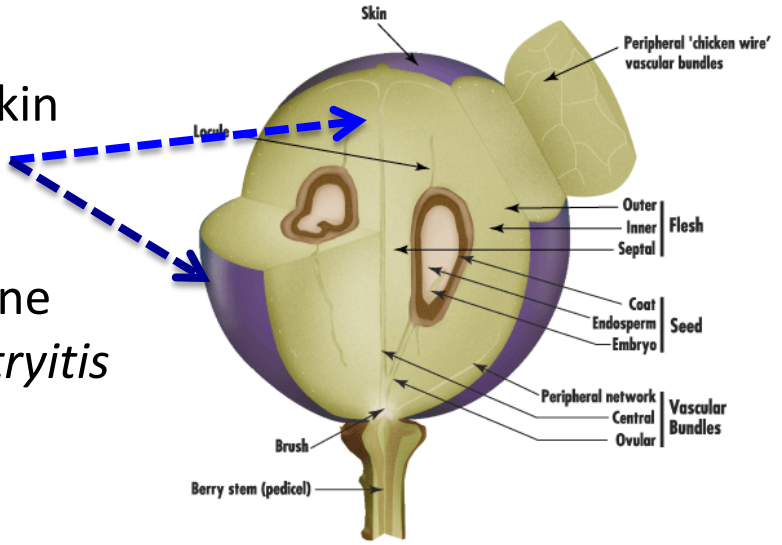


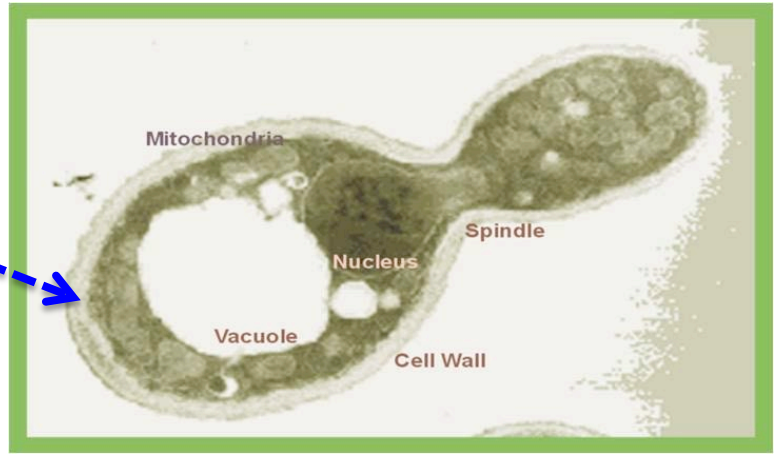
Figure I: Structure of a ripe grape berry partially sectioned on the long and central axis to show internal parts. Illustration by Jordan Koutroumanidis, Winetitles.

Yeast Polysaccharides – ***Mannoproteins*** or mannans (mannose polymers)

Liberated from ***yeast cell walls*** (autolysis)

Lees aging (Sur Lies) via Batonage / Stirring

Thought to provide ***colloid stability*** during aging and a richness in texture (Chablis).



Pectolitic enzymes can influence the size and solubility of polysaccharides

Typically added at crush pad to liberate juice, aid in maceration, pressing and clarification.

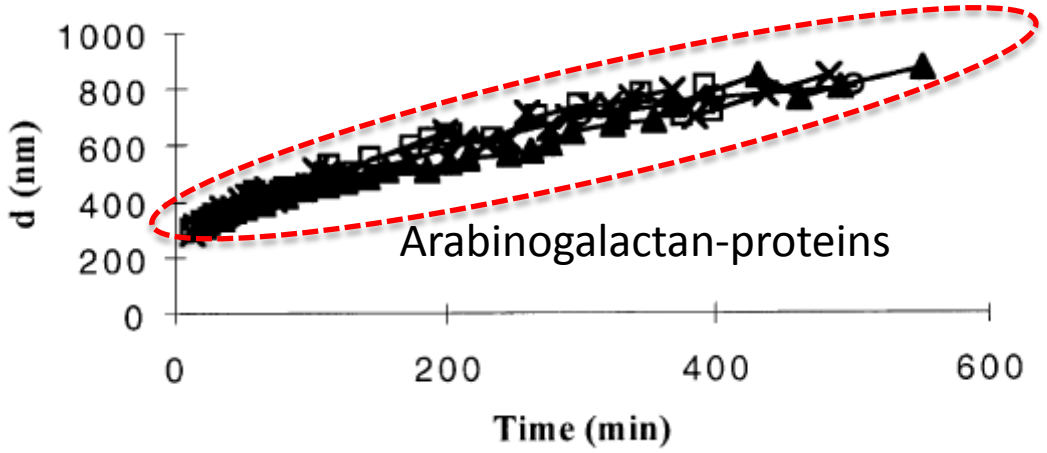
Skin contact, phenolics, and fining agents can also influence final content

Lees aging (Sur Lies) via Batonage / Stirring

Common method to enhance texture and body of white and red wines

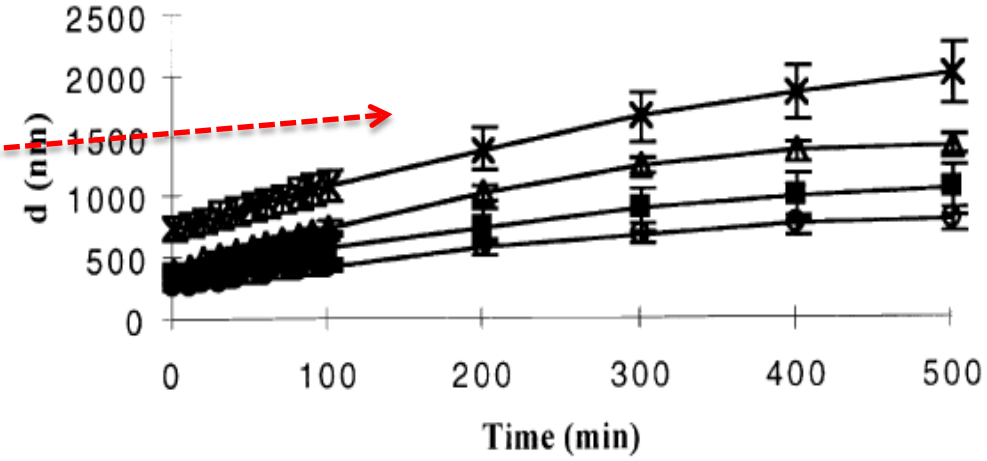
Requires time and attention (*and good lees*)

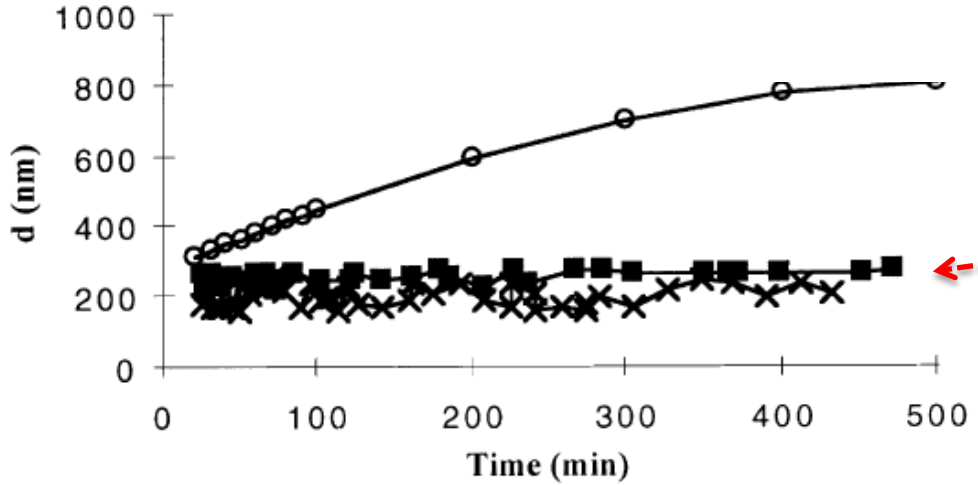
Avoid H_2S formation



Tannin /colloid aggregation (size in diameter)

Rhamnogalacturonan II dimers
The more RGII-d's, the greater the aggregation.
(0.05 – 0.5 g/L)





Yeast Mannoproteins
Inhibit aggregation
(0.05 g/L – 1.0 g/L)

Riou et al. (2000) Food Hydrocolloids. 16, 17-23.

Exogenous Polysaccharides or Gums

Colloid stability (color, aroma, tannins), volume enhancement, balance

Commercial yeast and grape-based preparations

Biolees, Opti-red, Surli products, Claristar

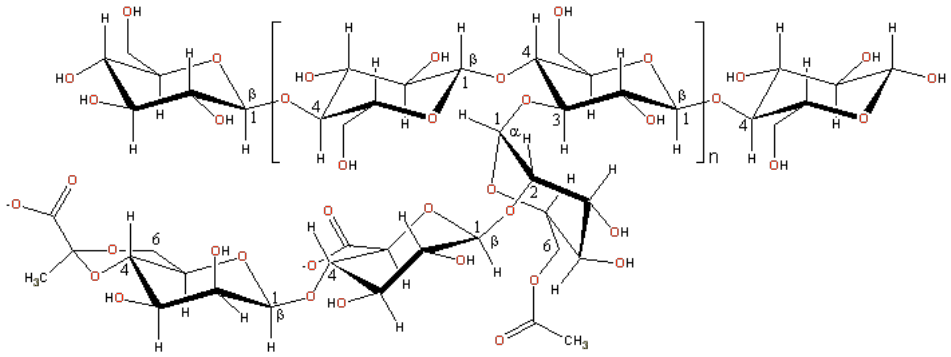
Intended to be *added at different times* based on desired outcome (fermentation aid vs. cellaring / aging / finishing)

Commercial Gum-based preparations

Typically gum arabic (Acacia tree), guar gum (guar bean), fruit pectin

Intended to be soluble, odorless, and stable

Numerous products available depending on desired outcome



Tannins

Tannins provide astringency, contributing to the perception of wine texture and mouthfeel

Astringent, Rough, Chalky, Silky, Creamy, Abrasive, Drying

Principle activity stems from the ability to **bind proteins**

Tanning leather / hide

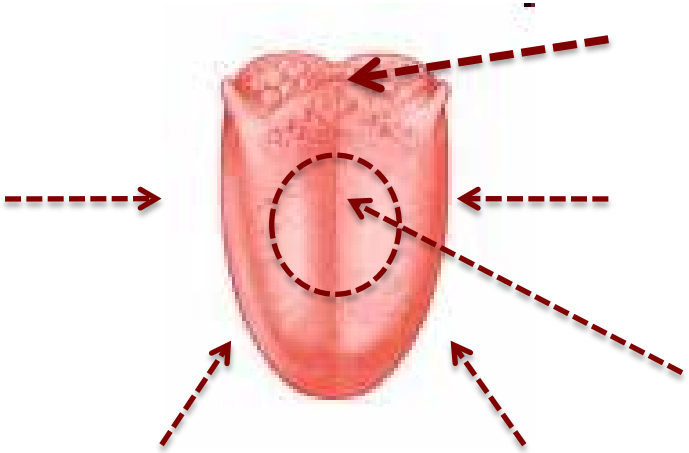
Proteins in salivary excretion are precipitated (***Proline-Rich-Proteins, PRPs***)

Loss of lubrication; drying or astringent sensation

For **some reason – people respond positively to this attack on the tongue!**

Provides depth, texture, and a wine to chew on

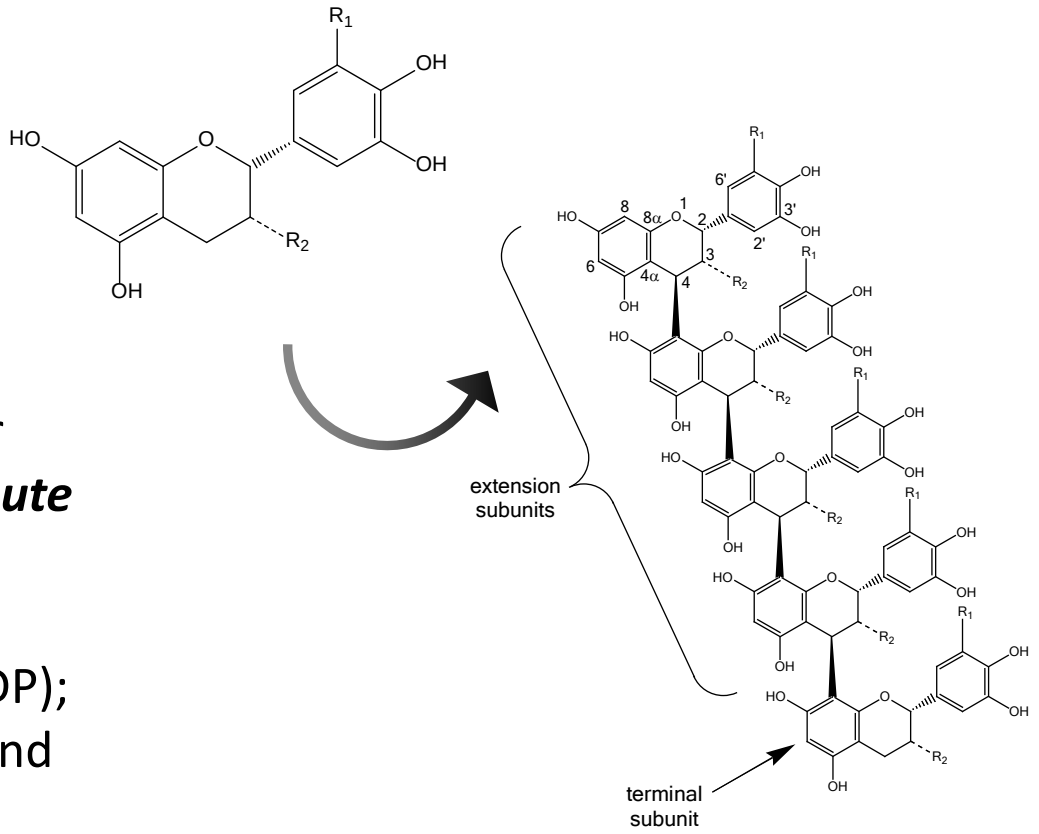
Ideally tannins provide a **round or full texture**; not ***angular*** or a ***'donut'*** wine



Tannins

Flavan-3-ols / Proanthocyanidins (PAs) / Tannins

- Found in ***all tissue.***
- Di- and Tri-OH in skin.
- Di-OH and gallate-ester in seed.
- ***Ellagitannins from Oak***
- Sensory properties related to substitution and polymer size.



- **Seed tannins** are generally **smaller** polymers (mDP); ***thought to contribute bitterness***

- **Skin Tannins tend to be larger** (mDP); providing ***more astringent quality*** and less perceived bitterness.

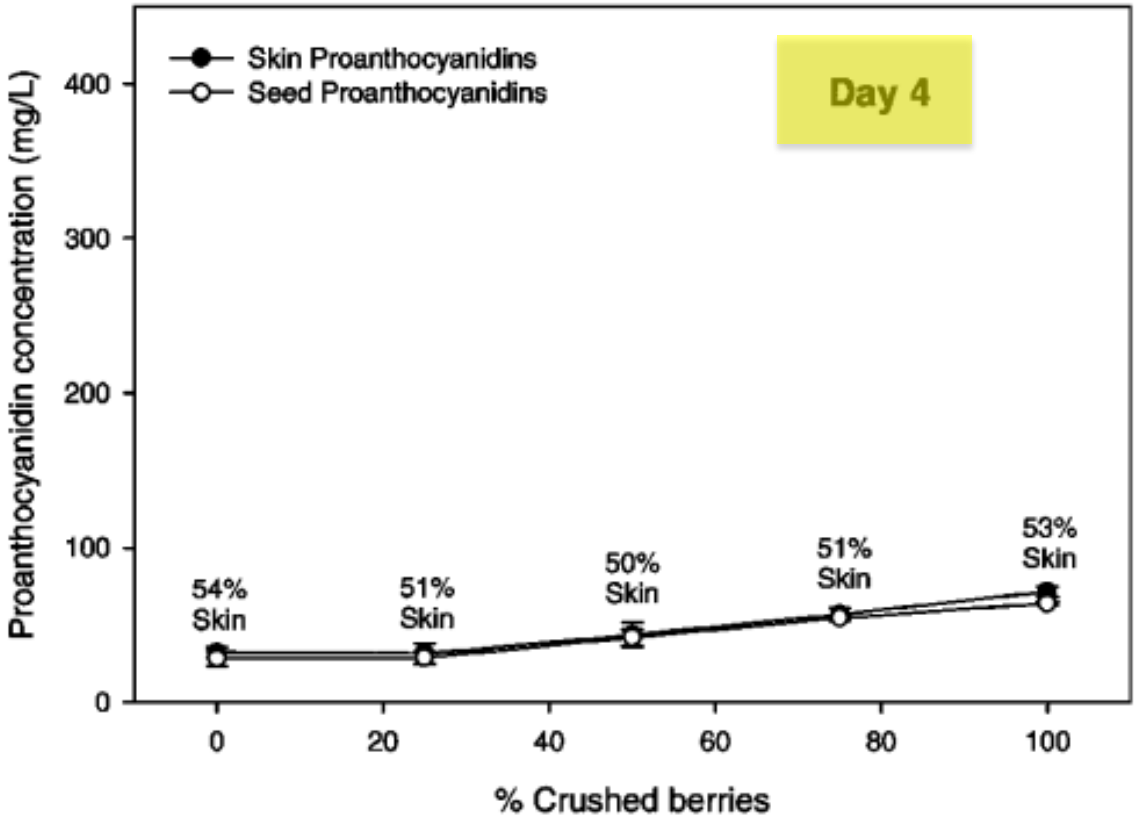
- **In the vineyard**, *light exposure before véraison* is probably the most influential factor relating to tannin content.

Tannin Extraction

Tannin extraction is dictated by ***maceration, time, ethanol content, interaction with other components*** (proteins and polysaccharides)

Saignee is an effective method to increase tannin content of wines (juice : pulp).
Balance ethanol content with effect on tannin content

Crushing berries ***does not appear to have the impact often assumed*** (Merlot)



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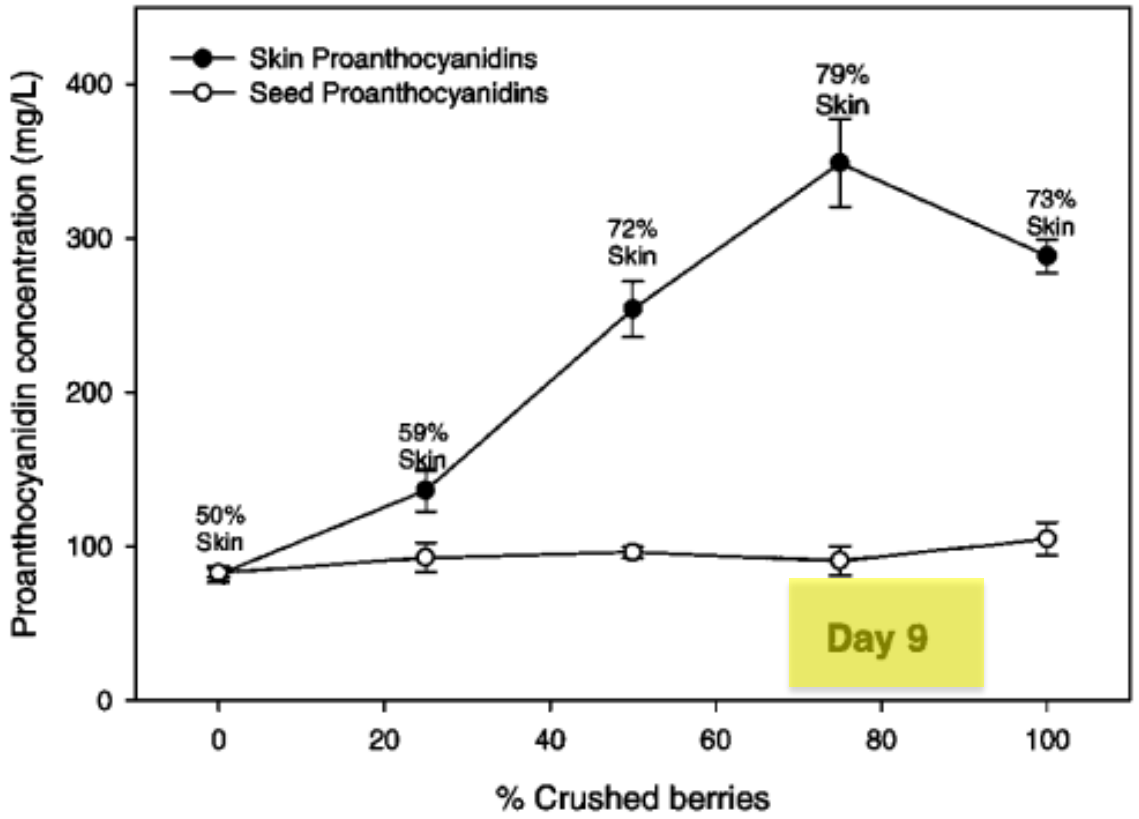

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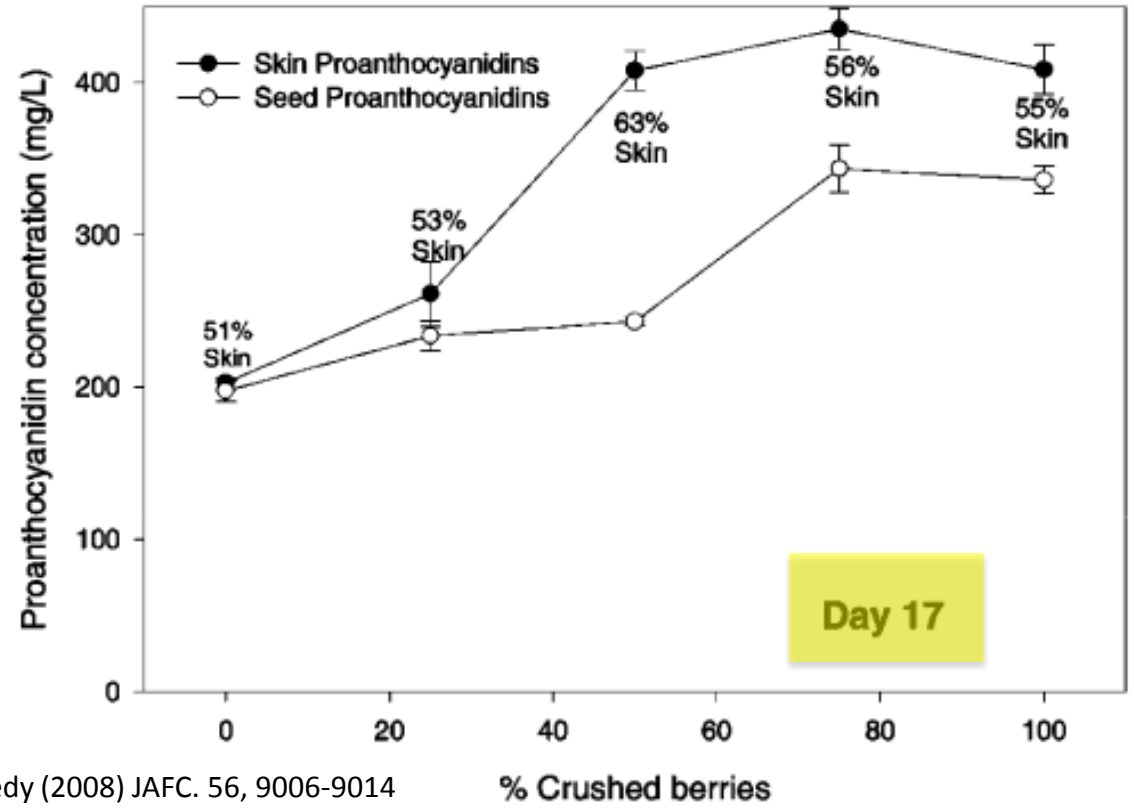

Cerpa-Calderon and Kennedy (2008) JAFC. 56, 9006-9014

Tannins

In addition, ***seed tannins do not appear to negatively effect wine quality***

Studies show a ***preference for the contribution of seed tannins*** in red wine.
Seed removal and seed additions during fermentation
(*Lee at al. (2008) Food Chemistry. 1270-1273; Kovac et al. (1995) AJEV. 363-367*)

During aging – tannins aggregate, form associations with other molecules, and oxidize (reactive). Alters overall perception, intensity, and quality of astringency.

The "Softening" of red wine occurs over time due to oxidation
This process involves ***oxidative polymerization, intermolecular associations, and precipitation*** (development of mature wine color evident).

The presence of polysaccharides / proteins / fining agents will also influence tannin content / perception

Fining trials with ***Gelatin, Isinglass, PVPP*** – Dial in perception of tannins but critical to *consider the intention of aging wine*.

Exogenous tannins:

Grape-based and ***wood based*** (oak)

Do you want to incorporate aroma / flavor?

Fermentation tannins (white wines, red wines)

Added at the crush pad, to must, pressed juice.

Typically in a range from ***50-200 ppm***

Help develop color (stabilize anthocyanins), protect against oxidation (flavor/aroma, browning), increase overall tannin concentration and encourage tanning development

Aging and cellaring tannins

Added at tank or at barreling, again from ***50-200 ppm***

Help protect against oxidation (***reduce SO_2***?)

Generally, a "rougher tannin", something that also benefits from modifications during the aging process

Still developing long-term color stability and focus on development / maintenance of aroma profile.

Finishing tannins

Added pre-bottling, typically ***weeks or months*** before wine is packaged

Should provide ***desired effect within 1-2 days of trial*** (maybe a slight overshot in intensity)

Important to be aware of ***potential instabilitie***s in wine (precipitates)

Can be effective anywhere from ***10- 200 ppm***; hopefully the low range of addition at this point (and they are typically more costly!)

Tannin Additions

Strategy of tannin additions is typically to *start rough and dial in* as the wine ages.

Assess the condition of the grapes / juice / must at harvest (can be difficult)

Make additions and allow time (1-2 weeks) to determine incorporation

By the time you hit the finishing tannins, that should be aimed at filling the palette in and providing a slight boost that will carry the wine through bottling to desired age.

Keep records for following years (<u>including additions + tasting notes</u>)

The best tannin for the job?!

You really have to **determine that for yourself**, but don't be accepting of the first product that seems to do the job

Tasting Wines – 3 Whites (W1-W3) and 4 Reds (R1-R4)

Starting from LEFT to RIGHT (W1 > W2 > W3)

Assess visual and aroma

Assess **Balance, Body, Astringency, Finish**

Do you **perceive differences** between samples?

Describe how they differ most.

Preferences?

Red Wines (R1 > R2 > R3 > R4)

Same process, this time **Astringency** and **Tactile sensations** are more pronounced

Try to identify attributes that differentiate the samples from each other

R1

Base Red
Barbera, Piedmonte
(Italy, in a box)

W3

Sucrose 0.5%
Addition of 5.0 g / Liter

R2

Tannin Riche
(Scott Labs)
Addition of 150 mg/ Liter

W2

Flash Gum
(Scott labs)
Addition of 1 ml / Liter

R3

Tanenol Fruitan
(Enartis)
Addition of 150 mg/ Liter

W1

Base Wine
Cortese, Piedmonte
(Italy, in a box)

R4

MaxiGum
(Enartis)
Addition of 1 ml / Liter

Bench Trials!

Prove to yourself that what you think you need is worthwhile.
Get input via blind tastings whenever possible.
Take advantage of sample products and determine what is right for you.

Use of gums in white and red wines

Increase volume, viscosity, stabilize color, aroma, tannins, colloids

Use of tannins in white and red wines

Protect against oxidation, stabilize color / aroma, provide astringency, fill holes in palette, increase aging potential (all of above), impart flavor (oak)

Consider ranges of gums: 0.05 – 1.0 ml /L
Tannins: 50-300 mg / L

Start by comparing various products for overall impact

- Consider variable additions of product to dial in
- Give wines time to acclimate (1-2 days)
- Get a consensus
- KEEP GOOD RECORDS