Old High German Word

It’s in the name “tannin”

For tanning hides

- Oak or Fir Tree
- Turn raw animal skin into leather
- Bind with proteins, rendering them non soluble in water
- Astringent
The sensation of astringency is caused by the ‘tanning’ of proteins in the saliva and mucous membranes of the mouth; lubrication is reduced and the surface tissues actually contract.
That doesn’t sound pleasant, why do we want tannins?

- Contribute balance vs. the sweetness of fruit, sugar, or (moderate) alcohol
- Provide “structure” to avoid overly soft or flabby character in the wine
- Help stabilize color during aging of red wine
- Act as anti-oxidants, preventing early oxidation and spoilage
Tannins are Polyphenolics

Phenol

Tannic Acid
Figure 1: The Polyphenolic Family Tree (or Vine)

- **Polyphenolic Compounds in wine**
  - **Flavonoids (<90%)**
    - Anthocyanins (Blue, Red)
    - Flavonols (Quercetin, Yellow)
  - **Tannins (Grapes, Oak)**
  - **Non-Flavonoids (>10%)**
    - Resveratrol, Benzoic Acid, Cinnamic Acid, etc.
  - **Grapes (Catechin, Epicatechin, etc.)**
  - **Oak (Ellagic, Gallic Acids)**
What About Your Wine?

Not Enough Tannin
- Soft, flabby mouthfeel
- Lighter color (in reds)
- Premature browning
- Oxidation and acetaldehyde
- Shorter cellar life in the bottle

Too Much Tannin
- Harsh, astringent, bitter
- Long aging before reaching drinkability
- Persistent astringent, puckery feel on the palate
Getting More Tannin
Traditionally: Grapes or Oak
Grape Tannins

- **When & How**
  - Vineyard practices
    - Better sunlight exposure
    - Smaller crop size
  - At crush
    - Add back some stems; maybe 10%
  - Before fermentation with cold soaking
  - After fermentation with extended maceration
  - Direct addition
Grape Tannins, cont.

• Skin tannins are favored
  – Break the skins
  – Contact with juice
  – Contact with alcohol

• Seed and stem tannins are harsh and “green”
  – Use an effective destemmer
  – Hand remove “mog”
  – Do not break seeds
  – Consider “delestage” or something like it

• Grape tannin extracts can be added directly

• Some enzymes may also boost extraction
Adding Tannins

- Choose what source of tannins you want to use for your wine
- Select the best time for maximum effect from your addition
- Make the addition
- Monitor the results through continued tastings
Oak Tannins

- When and How
  - Oak chips in primary
  - Barrels, sticks, chips during aging
  - Oak tannin powder as a “finishing tannin” addition up to 3 weeks before bottling
  - Liquid alcohol extract of oak any time
Oak, cont.

- Chips during fermentation are especially useful if you predict a too-soft tannin profile
  - Kit wines that will not have alcohol/skin contact
  - Light, fruity varietals with low maturity

- Oak: Barrels are the best, *but*…
  - You need to be making enough wine to use a barrel
  - You now have another hobby
  - The effects can be dramatic; taste often
  - The same barrel will change over time
More from Oak

- Sticks, staves, spirals
  - Solid wood is a more “barrel-like” profile
  - Generally not re-usable
  - Start at the low end of the manufacturer’s recommendations

- Finishing tannin powder

- Liquid oak extract
Other Sources

- Quebracho, oak gall nuts, chestnut wood
  - Prepared formulations

- During Fermentation
  - “Sacrificial” tannins mostly for color stability

- In the cellar
  - Protect against oxidation

- Finishing
Other, cont.

- Decide when in your winemaking you might benefit

- Try products based on manufacturer’s published information

- Add a mid-range dose as directed

- For finishing tannins, do a trial

- Taste, taste, taste
What About Managing Too Much?

- Usually with red wine
- Young vineyard
- Overcropping
- Tannic varieties
  - Tannat
  - Petite Sirah
  - Cabernet
- Excessive extraction
  - Seeds
  - Stems
- Adding too much
Removal of Tannins

- Age out in barrel or carboy
  - Tannins polymerize, become rounder
  - Drop out

- Age in bottle
  - May produce sediment

- Fine with proteins
  - Proteins bond with tannins and precipitate
  - Several choices
  - Different effects
Proteins: Traditionally of Animal Origin
Largest Group of Fining Agents

- React primarily with polyphenolic materials like tannins
- Used to reduce harshness, soften, and round out wine (usually reds)
- Some reactivity with oxidized compounds
- Not for clarity, although it may improve
- “Overfining” is a risk with these
  - Proteins left over or wine stripped
Proteins, cont.

- Take home concept: proteins are for reducing astringency and bitterness in red wines

- Most are of animal origin
  - Vegetarians might use egg whites or casein
  - Vegans cannot use any of the traditional protein fining agents
  - New plant-based products are arriving; more on that later
A Range of Animal Products

- Isinglass
  - From Sturgeon swim bladders

- Gelatin
  - From animal bones, hides, and tendons

- Egg whites

- Casein
  - From milk
How Proteins Work

- All act on polyphenolics--anthocyanins and tannins
- Protein carbonyl groups hydrogen bond with hydroxyls
- Larger clusters settle out
- Remove astringency, bitterness, color

Zoecklein et al, Wine Analysis And Production, Chapman & Hall 1995
Isinglass

- From swim bladders of sturgeon, other wild fish
- Prehydrolized or flocced
- Molecular weights around 140,000
- For white wines to unmask fruit character
- Less active against condensed phenolics--astringent tannins--than other proteins
- Less tendency to overfine
- Bulky lees
- Can degrade with age, cause fishy aromas
How to Use Isinglass

- Gentlest of the protein finings
- Use for clarification, bitterness, possibly astringency
- Use fresh product
- Follow package instructions; acid or soaking is sometimes required
- Use from 0.25 to 0.6 grams per gallon
Isinglass Application

- For 5 gallons:
  - Soak 1 Tbsp. of granules in 2 cups water with 1/2 tsp citric acid
  - Let stand 30 minutes
  - Add to wine
  - Stir
  - Settle
  - Rack

- For 100 mL trial:
  - Soak 1/2 tsp in 1/2 cup water with a few grains of citric acid
  - Stir
  - Take out 1/2 tsp
  - Add to 100 mL wine
  - Shake
  - Let stand overnight
  - Check clarity, aroma, astringency
Gelatin

- Similar to gelatin in packaged desserts
- Molecular weight ranges from 15,000 to 140,000
- Prepared from collagen, the structural protein of skin and bones
  - Beef was common in history
  - Now mostly from swine
  - No concern about “mad cow”
Bloom Units

- Ability to "gel"
- 6.6% solution for 18 hours at 10 deg. C
- Grams of weight required to press a 1/2" stamp 4 mm deep
- Enological gelatin about 80 to 150 bloom
- Dessert-mix gelatin about 175 to 275 bloom
Action

- Bonds preferentially with larger polyphenols
- Flexible molecule conforms to targets
- Less effect on color, tannin in young wine
- May shift colors from brown to ruby
- May “strip” wine
- May need to “counterfine” with added tannins
How to Use Gelatin

- Need to rehydrate dried products
- Liquid products are often degraded and do not stay fresh
- Use at a rate of 0.03 to 0.5 grams per gallon
- Run trials to avoid stripping a wine!
Gelatin Application

- For 5 gallons:
  - Dissolve 1/4 ounce in 10 ounces hot water
  - Let stand 10 minutes
  - Stir into wine
  - Rack when settled
  - Consider a tannin addition to remove excess gelatin if heat stability matters

- For 100 mL trial:
  - Dissolve 1/2 tsp in 1/2 cup hot water
  - Let stand 10 minutes
  - Stir, scoop out 1/2 tsp
  - Add to wine sample
  - Shake to mix
  - Let stand overnight
  - Observe for color and taste for astringency
Egg Whites

- Active component is egg albumen
- Other proteins that are less water soluble
- May need to add a small amount of salt
- Removes less fruit character than gelatin
- Seldom used in white wines due to need for counterfining to remove excess protein
How to Use Egg Whites

- Separate fresh eggs--use yolks for another purpose
- Whites can be added directly to barrel
- More often, beaten with water and wine
- Avoid stiff foam; it will float on wine
- Use potassium chloride, not sodium, for salting commercial egg white finings
- Let stand days to weeks; rack
Egg White Application

- For 5 gallons:
  - Lightly beat one white, take half
  - Add a little water and wine
  - Beat lightly together
  - Stir into wine
  - Let stand until clarity returns
  - Rack off

- For 100 mL trial:
  - Lightly beat one white
  - Add 2 cups distilled water
  - Beat again
  - Take 1/4 tsp of this solution
  - Add to wine sample
  - Shake to mix
  - Let stand overnight
  - Observe and taste
Casein

- Primary protein of milk
- Molecular weight about 375,000
- Available as powdered casein from milk
  - Need to hydrate under alkaline conditions
- Or use potassium caseinate, directly soluble
- Can use whole or skim milk
- Can reduce brown color in white wines
Casein, cont.

- Can help prevent pinking of white wines
- Softens tannins of red wines, but not as much as gelatin
- Use from 0.05 to 1 gram per gallon
- When milk is used, wine acid quickly causes it to coagulate
- Casein binds with polyphenolics and they drop out
Nonfat Milk vs. Whole Milk

- **Nonfat**
  - Advantage over potassium caseinate by adding lactose
  - Without fat, removal is easy and there is little risk of rancidity

- **Whole**
  - Same sweetness
  - May absorb unpleasant aldehydes or even TCA ("cork taint") into fat
  - Possibly effective against smoke taint
  - Must rack away from lees and any floating fat

Note: BATF limits milk to 0.2% of volume (40 mL in 5 gallons), but higher use rates may benefit home wine where dilution is not a market concern
How to Use Casein Products

- For powdered casein, dissolve in water at pH greater than 8
- For potassium caseinate, dissolve in distilled water
- For milk, add directly
- Rack in about 4 days to avoid bacterial activity
- May need to counterfine with tannins or bentonite
Milk Application

- For 5 gallons:
  - Add up to 250 mL directly to wine
  - Let settle
  - Rack
  - Fine with bentonite and rack again

- For 100 mL trial:
  - Add 1/4 tsp milk to 100 mL wine
  - Shake to mix
  - Let stand overnight
  - Observe for clarity
  - Taste for reduced astringency and bitterness
New Choice for Vegans: Plant Protein

- Mostly pea proteins
- Proprietary products
- Enartis Plantis AF
  - Clarify and stabilize red, white, rose’
  - Allergen free
  - No animal ingredients
  - Removes tannins
  - Also oxidized polyphenolics, iron
- Other brands emerging—no endorsement
Plantis AF Application

- For 5 gallons:
  - Suspend 2 to 6 g in 10x water
  - Stir the suspension thoroughly into wine or add while racking
  - Let settle
  - Rack
  - Treat with bentonite if not completely clear

- For 100 mL trial (at 5 g level):
  - Suspend 1 g in 100 mL distilled water
  - Stir to mix
  - Quickly add ½ tsp. to 100 mL wine
  - Mix thoroughly
  - Let stand overnight
  - Taste for reduced tannin level
Summary for Managing Tannins

- Taste, taste, taste
- You can increase or decrease
- Do trials
- Proceed with care
- Make better wine!