INNOVATIVE OAK TANNINS

Tannin Seminar-March 16 2016
Glenn Jeffries/Amy LaHue
What is Tannin?
- Polyphenols
- Enological Tannins
- Tannin Sources

Benefits of Tannin
- Oxidation/Reduction Control
- Color Stability
- Structure and Mouthfeel
- Protein and Enzyme Control

trū/tan
- Blended Tannin
- Highest Quality Oak
- Purest Gallotannin
- Solubility
What is Tannin?

• The term tannin applies to plant polyphenols that are water soluble, astringent, bitter and have the ability to precipitate proteins as well as form soluble complexes with other polyphenols and metals.

• Due to these properties, some tannins are used in winemaking.

• Tannins used in winemaking are referred to as Enological Tannins
What is a Polyphenol?

Water Soluble
Alcohol Group

Water Insoluble
Phenyl Ring

Phenol

Polyphenol
Why Are Phenols Important In Winemaking?

Phenols react with each other, other organic compounds, and Oxygen to create new compounds that are vital to a wine’s color, flavor, aroma and texture.
What Are The Most Commonly Used Enological Tannins?
Enological Tannin

Hydrolysable

- Gallotannin
  - Gall Nut
  - Tara Pod
- Ellagitannin
  - Oak
  - Chestnut

Condensed

- Proanthocyanidins
  - Grape Skin
- Profisetinidins
  - Grape Seed
  - Quebracho
Hydrolyzable Tannin-Gallotannin

Gallic Acid

Gallotannin
Oak Gall Nuts from an Oak Tree are the richest source of Gallotannins

The tree exudes a tannin rich secretion to protect itself from insect (usually wasp) attack, and forms a gall.
Tara Pods contain Gallotannins that are similar to Gall Nuts.

Caesalpinia Spinosa (Tara Tree) is a small shrubby tree which forms pods with beans. The pod skins are a rich source of Gallotannin.
Enological Tannin

Hydrolysable
- Gallotannin
  - Gall Nut
  - Tara Pod
- Ellagitannin
  - Oak
  - Chestnut

Condensed
- Proanthocyanidins
  - Grape Skin
  - Grape Seed
- Profisetinidins
  - Quebracho
Hydrolyzable Tannin-Ellagitannin

Gallotannin

Ellagitannin
Oak Heartwood is the Highest Quality source of Ellagitannins in an Oak tree.

Ellagitannins are converted from Gallotannins by the tree using enzymes. They help control oxidation reduction reactions in the tree, and protect the tree from microbial attack.
Ellagitannin-Oak

Tannin levels in young trees is high in the bark and lower in the heartwood.
Ellagitannin-Oak

![Graph showing the concentration of tannins in heartwood and bark over tree age.](image-url)

- Tannin Concentration
- Tree Age
- HEARTWOOD
- BARK
Ellagitannins-Chestnut

Chestnut is a rich source of Ellagitannin, but provides a much higher level of astringency and less body than Oak without the pleasant Oak aromatic profile.
Enological Tannin

Hydrolysable

- Gallotannin
  - Gall Nut
  - Tara Pod

- Ellagitannin
  - Oak
  - Chestnut

Condensed

- Proanthocyanidins
  - Grape Skin
  - Grape Seed

- Profisetinidins
  - Quebracho
Condensed Tannin-Grape

Proanthocyanidin derived from grape skins and seeds

Polymers form in sheets
Enological Tannin

Hydrolysable
- Gallotannin
  - Gall Nut
  - Tara Pod
- Ellagitannin
  - Oak
  - Chestnut

Condensed
- Proanthocyanidins
  - Grape Skin
  - Grape Seed
- Profisetinidins
  - Quebracho
Condensed Tannin-Quebracho

- Chemically Similar to Grape Tannins
- Inexpensive
- Bitter
- Astringent
- Inconsistent Tannin Content
Condensed Tannin-Quebracho

Tannin Concentration is Inconsistent From Top to Bottom and From Exterior to Center

Cross Section Slices Showing Inconsistency From Exterior to Center
What Are The Benefits of Using Enological Tannins?

- Oxidation/Reduction Control
- Color Stability
- Structure/Mouthfeel
- Protein/Enzyme Control
Oxidation/Reduction Control

Oxygen Scavengers

- Enological Tannins, especially Ellagitannins, are *Oxygen Scavengers* that lock up excess Oxygen, but can slowly release it back into the wine if available Oxygen becomes too low

- A low, steady supply of Oxygen allows the formation of fresh, complex, and fruity characters in wine

- Too much available Oxygen at any time leads to production of Organic Acids and other oxidation products that are unpleasant
Oxidation/Reduction Control

An Oxidized White Wine That Has Turned Brown
Oxidation/Reduction Control

Metal Chelators

- Enological Tannins can form soluble complexes with metals, especially Iron, called chelates
- Direct Effect - Unchelated Iron turns reddish brown
- Indirect Effect - Unchelated Iron is a catalyst and wine phenolics turn brown
Color Stability

- Anthocyanins come from grape skins and stems
- Provide red color in red wine
- Over 550 different Anthocyanins
- Unstable, can be bleached by SO2 if left unbound by tannin

Bleached Anthocyanin
Anthocyanin-Tannin Reaction

- Anthocyanin is protected from bleaching
- Ellagitannins and Gallotannins also bind and protect Anthocyanins
- Long term color stability enhanced.

Free SO2

Grape Tannin

Protected Anthocyanin
Structure/Mouthfeel

• Chemical interactions create a sensation of weight

• Broaden the area of the palate that is being interacted with

• Soften and round off the harshness of native grape tannins

• Increase aging potential
Protein/Enzyme Control

- Precipitation with undesirable wine proteins can improve clarity and temperature stability in wine
- Enzymes like Laccase can be removed or deactivated by the use of Enological Tannins
Hybrid Grapes

Average tannin content in typical non-Vinifera grapes is lower, but not drastically lower.
Hybrid Grapes

Extraction of hybrid grape tannins into wine is much lower due to interference from grape cell wall compounds.
Hybrid Grapes

- Extraction of native grape tannins enhanced most by addition of oenological tannins
trū / tan Advantage

- Blends of Ellagitannin and Gallotannin
- Highest Quality Oak
- Purest Gallotannin
- Extremely High Solubility
Different Tannin Types, Why Is It Important?

- Color Stability

- Different tannin types blended together protect color better than adding more of the same type of tannin

- 550 different Anthocyanins that each react uniquely to tannin

- Each tannin type is suited for complexing with different Anthocyanins
Different Tannin Types, Why Is It Important?

- **Structure/Mouthfeel**

  - Tannins react with each other and wine polyphenolics to create soluble complexes
  
  - More diversity in the tannin building blocks means more complexity in tannin structure
  
  - More sophisticated mouthfeel experience with **less astringency**
Different Tannin Types, Why Is It Important?

• Structure/Mouthfeel

Example - using only one type of tannin limits the structural complexity.
Different Tannin Types, Why Is It Important?

- Structure/Mouthfeel

Example - using multiple types of tannin immediately increases complexity of structure.
trū / tan Advantage

Ellagitannin from Oak & Gallotannin from Gall Nut

2 Different Types of Hydrolyzable Tannin in Our Blends

Proanthocyanidins From Wine Grapes

3 Different Types of Tannins Working Together!
Different Tannin Types, Why Is It Important?

- Astringency

Grape tannin polymer sheet
Different Tannin Types, Why Is It Important?

- Astringency

Example - grape tannin polymer sheets are like strips of adhesive.
Different Tannin Types, Why Is It Important?

- Astringency

Ellagitannin

Grape Tannin

Blended Tannin Complex
Different Tannin Types, Why Is It Important?

- Astringency

Example - blended tannins fold up and become less astringent
trū / tan Advantage

Highest Quality-Oak

- Cooperage Grade Oak Heartwood
- Fully, Properly Seasoned Oak
- Proprietary, Precision Toasting
- Pure Extraction Process
trū / tan Advantage

Purest Gallotannin

- Naturally high in total tannin content
- Extracted with gentle techniques designed to avoid impurities
- Additional purification step to lift the Gallotannin purity up to 98%
Highest Quality Oak + Purest Gallotannin

• Higher total tannin level—more effectiveness with a lower dosage rate

• Higher Quality—higher dosage rates can be applied without including negative sensory impacts
trū / tan Advantage

Solubility

Hydrolyzable-Gallotannin

Condensed-Grape Tannin
Solubility

Hydrolysable tannins are more soluble than condensed tannins

- Less tannin loss to precipitation
- Reduce dosage rate
- Protect color longer
- Increase aging potential
Fermentation tannin with Ellagitannins from lightly toasted Oak and more than 90% total tannin

- Fruit Lift
- Antioxident
- Color Protection
- Structure
Blend of hydrolysable tannins, gallotannins and ellagitannins with more than 75% total tannin

- Color Protection
- Antioxident
- Structure
- Freshness
Versatile tannin for any step of the vinification process with more than 70% total tannin

- Antioxidant
- Balance
- Softer Palate
- Subtle Oak Aromatics
More than 65% total tannin, a perfect product for aging and finishing

- Rounder Mouthfeel
- Toasted Oak Aromatics
- Complexity of Varietal Character
Proprietary oak toasting method results in a polyphenol profile that rapidly integrates with native grape tannins. Greater than 70% total tannin.

- Rich sweetness in flavor and aromatic character
- Rapid integration
- Softer mouthfeel

New for 2016
Powerfully aromatic finishing tannin with more than 70% total tannin.

- Toasted Oak Aromatics
- Broader Mouthfeel
- Layered Complexity
# Tannin Application Guide

## White Wine

<table>
<thead>
<tr>
<th>Process</th>
<th>Code</th>
<th>Description</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crush</td>
<td>f_i</td>
<td>Antioxidant, laccase inhibition, wine aromatic protection</td>
<td>3.5 g/L</td>
</tr>
<tr>
<td></td>
<td>f_2</td>
<td>Antioxidant, wine phenolic protection</td>
<td></td>
</tr>
<tr>
<td>Press</td>
<td>f_i</td>
<td>Antioxidant, laccase inhibition, wine aromatic protection</td>
<td>3.5 g/L</td>
</tr>
<tr>
<td></td>
<td>f_2</td>
<td>Antioxidant, wine phenolic protection</td>
<td></td>
</tr>
<tr>
<td>Fermentation</td>
<td>f_i</td>
<td>Freshness and fruit lift, antioxidant, color protection, structure</td>
<td>5-10 g/L</td>
</tr>
<tr>
<td></td>
<td>f_2</td>
<td>Antioxidant, color protection, structure, wine aromatic protection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>v_f</td>
<td>Antioxidant, color protection, structure, mouthfeel, subtle aromatics</td>
<td></td>
</tr>
<tr>
<td>Pre-bottling</td>
<td>f_i</td>
<td>Freshness and fruit lift, structure</td>
<td>3.5 g/L</td>
</tr>
<tr>
<td></td>
<td>v_f</td>
<td>Structure, subtle oak aromatics, mouthfeel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>r_f</td>
<td>Oak aromatics, mouthfeel, structure</td>
<td>1.3 g/L</td>
</tr>
<tr>
<td></td>
<td>i_b</td>
<td>Sweet aromatics, rapid integration, mouthfeel</td>
<td>3.5 g/L</td>
</tr>
</tbody>
</table>
# Tannin Application Guide

## Red Wine

<table>
<thead>
<tr>
<th>Stage</th>
<th>Symbol</th>
<th>Description</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crush</td>
<td>(f_i)</td>
<td>Antioxidant, laccase inhibition</td>
<td>5-10 g/HL</td>
</tr>
<tr>
<td></td>
<td>(f^2)</td>
<td>Antioxidant, wine phenolic protection</td>
<td></td>
</tr>
<tr>
<td>Fermentation</td>
<td>(f_i)</td>
<td>Freshness and fruit lift, antioxidant, structure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(f^2)</td>
<td>Color stabilization, antioxidant, structure</td>
<td>5-15 g/HL</td>
</tr>
<tr>
<td></td>
<td>(v_f)</td>
<td>Color stabilization, antioxidant, subtle oak aromatics, mouthfeel</td>
<td></td>
</tr>
<tr>
<td>Press</td>
<td>(v_f)</td>
<td>Antioxidant</td>
<td>2.5-5 g/HL</td>
</tr>
<tr>
<td>Aging</td>
<td>(v_f)</td>
<td>Antioxidant, structure, subtle aromatics, improved mouthfeel</td>
<td>5-15 g/HL</td>
</tr>
<tr>
<td></td>
<td>(r_f)</td>
<td>Mouthfeel, oak aromatics, antioxidant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(i_b)</td>
<td>Rapid integration, sweat aromatics, mouthfeel, antioxidant</td>
<td>3.10 g/HL</td>
</tr>
<tr>
<td></td>
<td>(v_b)</td>
<td>Barrel-like aromatics, mouthfeel, antioxidant</td>
<td>3.5 g/HL</td>
</tr>
<tr>
<td>Pre-bottling</td>
<td>(v_f)</td>
<td>Structure, mouthfeel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(r_f)</td>
<td>Mouthfeel, oak aromatics</td>
<td>3.5 g/HL</td>
</tr>
<tr>
<td></td>
<td>(i_b)</td>
<td>Rapid integration, sweet aromatics, mouthfeel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(v_b)</td>
<td>Barrel-like aromatics, mouthfeel</td>
<td>1.2 g/HL</td>
</tr>
</tbody>
</table>
Thank you,
Cheers!