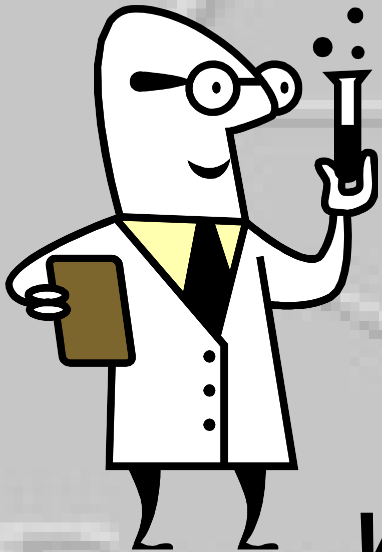

Presque Isle Wine Cellars Wine School

Presents

Winemaking 301 - Advanced

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Class Objectives

- pH relationship to "Titratable Acidity"
- pH relationship to sulfite additions
- Yeast differences
- Malo-Lactic Fermentation
- An introduction to tannins
- Fining and filtering

Review Titratable Acidity

- Method of quantifying acid content as tartaric
- Accomplished by titration with sodium hydroxide and a color indicator
- Accomplishment: Able to adjust acid level of must, juice or wine to create a sound product

Review pH

- pH is a measurement of the strength of the combined acids (ill.-Muscle measure size – TA; How much strength in muscle – pH)
- Indicates ability of a must to resist oxidation and bacteria invasion
- Used to determine how much SO_2 is needed

Quick Target Reference

- **White Grapes/Must**
  - pH: 3.1 to 3.4
  - TA: .65 to .90 g/L
  - Brix: 19º to 23º
- **White Wine – Dry**
  - pH: 3.2 to 3.4
  - TA: .60 to .80 g/L
- **White Wine – Sweet**
  - pH: 3.2 to 3.4
  - TA: .70 to .85 g/L
- **Red Grapes/Must**
  - pH: 3.3 to 3.8
  - TA: .60 to .80 g/L
  - Brix: 21º to 24º
- **Red Wine – Dry**
  - pH: 3.5 to 3.6
  - TA: .50 to .60 g/L
- **Red Wine – Sweet**
  - pH: 3.3 to 3.5
  - TA: .65 to .80 g/L

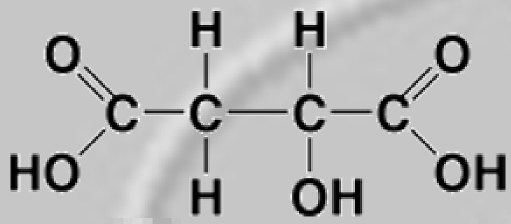
TA and pH Notes

- Both are measurements of acid
- No direct relationship; 2 wines same TA but can have different pH
- TA goes up pH goes down; TA goes down pH goes up – but not proportionately
- Most grapes' pH will fall in line as the acid is adjusted
- The pH increases and acidity slightly decreases during fermentation

Effects of Acidity

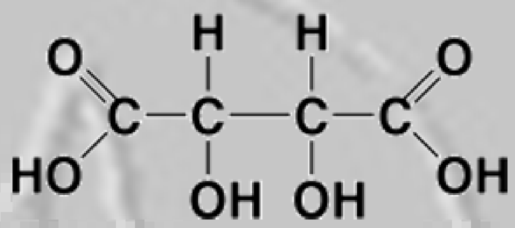
- Yeasts ferment more efficiently
- Bacteria do not like low pH.
- The efficiency of SO_2 increases a great deal at low pH.
- Too low an acidity leads to a flat taste (especially in sweeter wines).

Malic Acid



Why?

Tartaric Acid



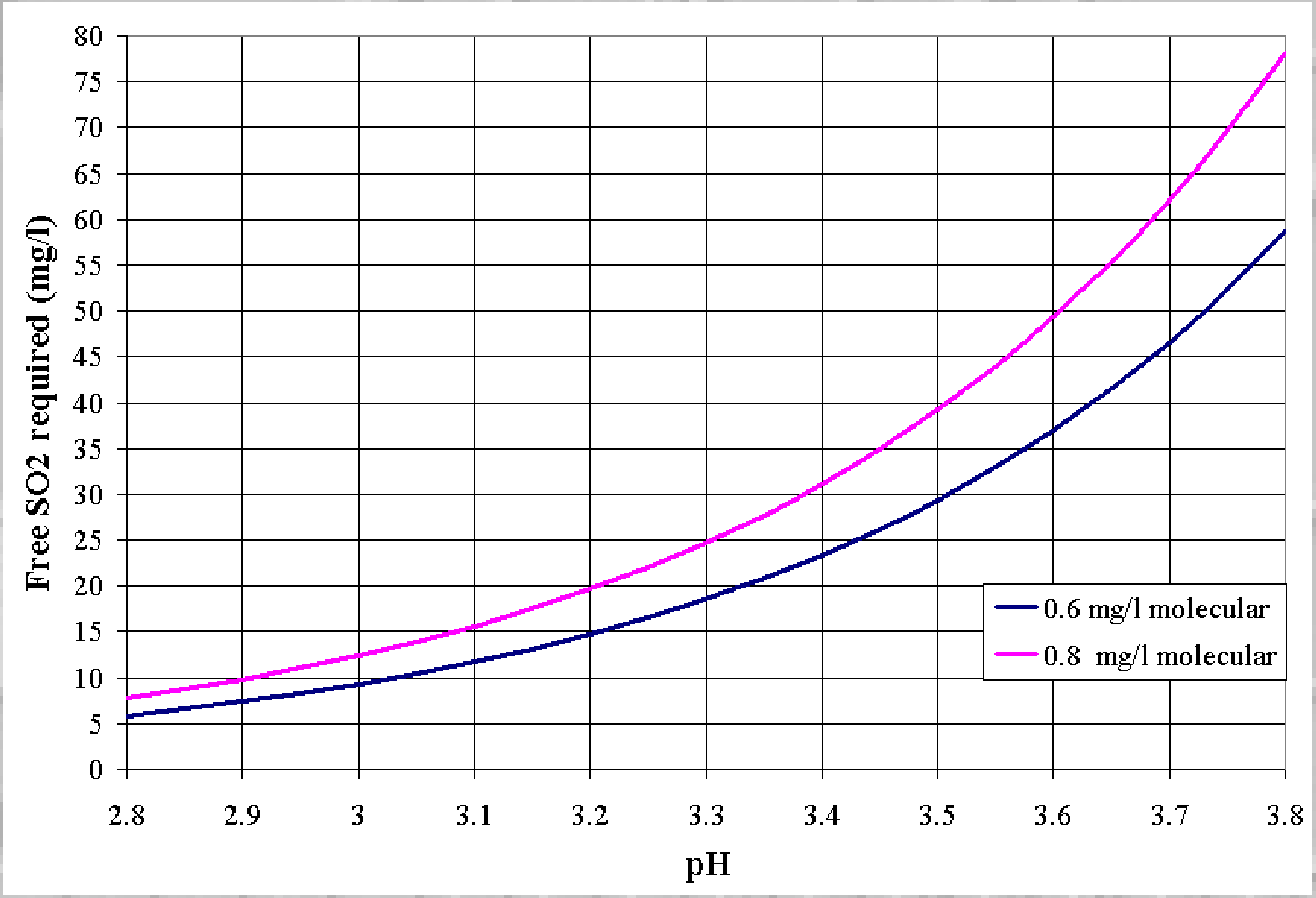
- You do not need to know to make good wine!!!
- For the curious - wine has more than one acid in it and each wine has different quantities of each acid. Since each acid has a different strength (pH), the pH change is dependent on the type of acid change.

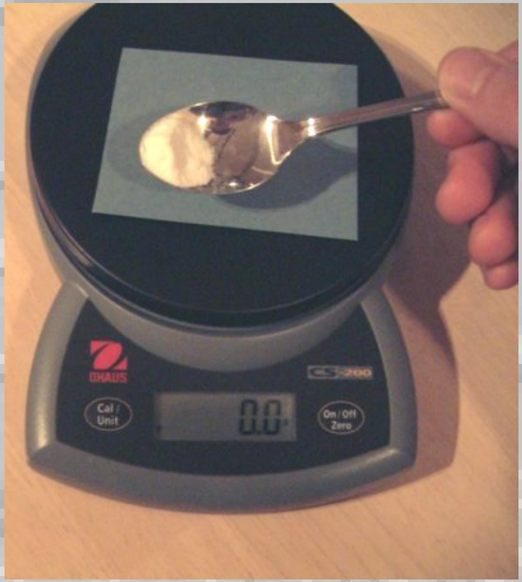
pH and SO_2 Effect

- The lower the pH the greater the effect of SO_2 (Potassium Metabisulfite)
- SO_2 at proper levels protects the wine by:
  - Inhibiting wild and spoilage yeasts
  - Inhibits unwanted bacteria
  - Helps prevent oxidation
  - Preserves fruity flavor and freshness

SO_2 required by pH

Top line: Whites; Bottom line: Reds

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Yeasts

- Thousands of types
- Groups of microorganisms which can cause fermentation through the enzymes they produce
- Present on grapes (called wild or ambient yeasts) and are capable of starting must fermentation
- Normal practice to add others with different characteristics

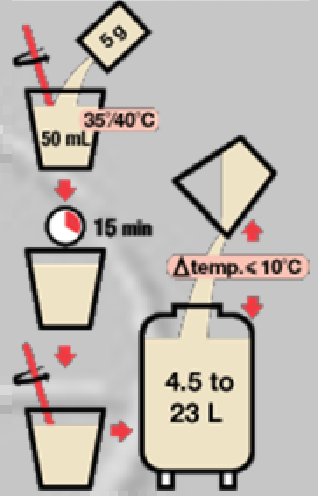
Yeasts continued

- Differing Characteristics
  - Result the wine maker wishes to obtain
  - Some are more resistant to alcohol
  - Some are more resistant to sulphur dioxide
  - Some are more resistant to cold
  - Contribute to the organoleptic qualities of the wine, esp. bouquet

Yeast Recommendations

- **White Sweet**
  - 71B
  - Cote' de Blanc
- **White Dry w/MLF**
  - Champagne
  - Montrachet 522
  - Premier Cuvee
- **White Dry w/o MLF**
  - EP2
  - 71B
- **Red Sweet**
  - 71B
  - K1V
- **Red Dry w/MLF**
  - RC212
  - Montrachet 522
  - D47
  - Pasteur Red
- **Red Dry w/o MLF**
  - EP2
  - 71B

Yeast Inoculation



- **REHYDRATION**
  - Critical to obtaining optimum yeast viability.
  - Disperse yeast in 40°C (105°F) water, at an addition rate of 5 g yeast to 2 oz. water
  - Let stand without stirring 5 to 15 minutes (never more than 30 minutes in water).
  - Water (not distilled) is preferable to juice for rehydration. The yeast cell membrane is very fragile until it is rehydrated and will allow any liquid to pass through. SO2 in the juice, at any level, can be lethal to the cells at this stage.
- **INOCULATING JUICE OR MUST**
  - After rehydration, stir yeast well to suspend all the yeast then mix yeast suspension and juice to be fermented until temperature is adjusted to 15°-20°C (59°-68°F). This will help avoid damage to the yeast by temperature shock.
  - Add temperature adjusted yeast suspension to juice or must.

Yeast Nutrients

- Go-Ferm – During yeast rehydration
- Fermaid K or Superferment – after 1/3 sugar depletion

Malo-Lactic Fermentation

- Malic acid in the grapes is converted into lactic acid during the secondary fermentation.
- Necessary enzymes are produced by bacteria rather than by yeast. Several different types of bacteria can produce malolactic (ML) fermentation, and these bacteria are called lactic bacteria.
- Lactic acid is weaker than malic acid, so malolactic fermentation reduces the overall acidity of the wine.
- Some byproducts produced during the ML fermentation can make a positive contribution to the complexity of the wine.

Malo-Lactic Fermentation Cont'd

- Typically a direct dry inoculation
- Tested by paper chromatography
- Tested by Accu-Vin tests
- Dry reds, few dry whites

Intro to Tannins

- Comes from the practice of using extracts from plants to cure leather (‘tanning’)
- **Tannins** themselves are found principally in the bark, leaves and immature fruit of a wide range of plants.
- Polyphenolic compounds that bind to and precipitate proteins
- **Polyphenols**. These are a group of compounds that are vitally important in wine.

Intro to Tannins Cont'd

- While tannins exist in grapes, what we are actually interested in is the tannins that are found in wine. There's a difference.
- Wine tannins come from grape skins, stems and seeds, and their extraction is heavily dependent on the particular winemaking process involved.
- Some tannins also come from barrels, particularly new ones, where these are used to age wine.
- The complicating factor here is that the chemical make-up of the tannins is actually changed during the winemaking process.
- Tannins contribute two characteristics to red wine character, astringency (most significantly) and bitterness

Fining & Filtering

- Fining agents work by physically absorbing or chemically binding with specific compounds
- Protein fining agents bind principally with wine and juice phenols
- Fining agents will affect or modify color, clarity bitterness, astringency, mouthfeel structure and stability of wines.
- Fining agents can reduce microorganism populations
- Fining is not just to remove a flaw but an integral part of finishing a wine in preparation for bottling

Protein Fining Agents

- **Gelatin:** hydrolysis of collagen from skin and bones (not bovine). The degree of hydrolysis determines molecular size and gelling capacity. Modern gelatins are more selective than egg whites. Liquid, granular or solid. Purity is important.
- **Egg whites:** fresh or frozen, 5-8 eggs/barrel. There are 3-4 gms of albumin per egg white.
- **Casein:** positive charged macromolecule in milk. Binds with oxidative phenols in white wines to prevent or remove brown color formation.
- **Isinglass:** positively charged protein fining agent from fish bladders. Used in white wines to unmask fruit flavors. May need to counterfine with bentonite to completely settle. If not pure may have “fishy” odor.

Non-Protein Agents and Blends

- **Bentonite:** clay working by absorption
- **PVPP:** synthetic high molecular weight polymer composed of cross-linked monomers of polyvinylpyrrolidone. Works like protein binding with smaller phenols.
- **Hot or Cold Mix Sparkolloid:** polysaccharides in diatomaceous earth

Fining Agents

- Gelatin:
  - Gecoll Supra - liquid gel for red or white wine to target harsh tannins in juice
  - or wine
  - Gelarom-liquid gel to enhance aroma of white, rose or red wines
  - Gelatine Extra No. 1 - heat soluble powder gel for softening tannin harshness
  - in heavily structured red wines prior to bottling
- Egg white:
  - Fresh or frozen, traditional non-specific tannin removal
- Isinglass:
  - Ichtyocolle-instant product from fish bladders for white and rose clarification
- Gum Arabic
  - gem-like material sourced from the sap of Acacia tree
  - Stabivin - purified liquid, forms protective colloid inhibiting perception of
  - anthocyanins and sediment in bottle
  - Stabivin SP - liquid colloid protector to prevent sediment with added “soft
  - palate” perception of sweetness
- Casein:
  - Casei Plus – Whole milk product to prevent or remove oxidation in white or rose wine and improve clarification

Bottling

- Wine must be brilliantly clear and stable before bottling.
- Bottling is a simple operation, but several points should be considered before the bottles are filled.

Bottle Filling

- Clean bottles should be rinsed with very hot water just before filling.
- Then rinse each bottle with a sulfite solution and drain the bottles.
  - Make the sulfur dioxide solution by mixing 1/4 teaspoon of sulfite crystals and a teaspoon of citric acid in 750 ml of water.
  - This sulfite solution is strong enough to kill bacteria, but the bottles must be drained carefully.
- Use some kind of bottle filler to reduce wine oxidation.
- Bottles should be filled from the bottom and with a minimum amount of foam and splashing.
- Bottles should be filled until no more than 1/4 inch exists between the wine and the bottom of the cork.

Corking

- Driving dry corks is preferred.
- Some small hand corkers cannot compress dry corks adequately and presoaked corks must be used.
- Presoak corks in cold water for an hour or so to soften them.
- A pinch of sulfite added to the water may help sterilize the corks.
- Drive corks flush, or slightly below the lip of the bottle.
- Remove spilled wine from the bottles, or the wine residue will become moldy.

Labeling

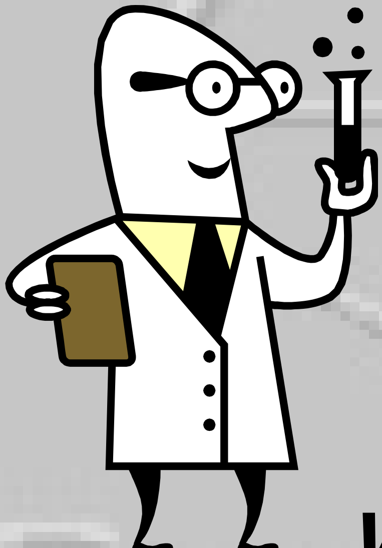
- All bottles should have some kind of label to identify the contents.
- Attractive wine labels can be made with a home computer.
- Common white glue is often used for attaching wine labels.
- A few labels can be applied quickly with a "glue stick."
- Capsules and labels can be applied when the bottles are clean and dry.

Bottle Aging

- Bottles should stand upright for a week or two after corking.
- Stored the bottles on their sides or upside down in a cool place after the pressure has equalized.
- Red wines are usually aged in the bottle for one or more years to develop bottle bouquet.
- Heavier style white wines also benefit from bottle aging.

Adjustments Before Bottling

- Any blending should be done many weeks before bottling time so the winemaker can be sure the new blend is stable.
- Large additions of tartaric acid can make wine unstable and require additional cold stabilization.
- Usually, small amounts of citric acid can be added to white wines without upsetting cold stability.
- Cold stability should be checked before bottling white or blush wines by placing a wine sample in the refrigerator for 48 hours.
- The free sulfur dioxide content of the wine should be tested and adjusted a day or two before bottling.
- Wines bottled with less than 30 milligrams per liter of sulfur dioxide will be short lived.



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