Vinspiration

Chapter 7
Common Elements in Winemaking and Maturation

Different winemaking approaches

Yeast -> converts sugar in grape juice to alcohol.
Natural wines = least human intervention as possible.

Common Elements in Winemaking and Maturation

Oxygen (oxidation)

- Gas reacts to grape juice
- Some positive/negative affects

Oxygen in winemaking

- **Anaerobic winemaking = min/no oxygen influence**
  - Used for wines with primary fruit characteristics
  - Grapes picked at night/chilled/airtight winery equipment (nitrogen/CO_2)

Oxygen in maturation

- If anaerobic -> airtight stainless steel/cement lined with epoxy resin vessel - full to the brim (no oxygen influence)
- **Aerobic maturation = wooden, oak vessels**
  - Soften tannins/develop tertiary characteristics/change in colour (red, paler/white, golden)
- Small vessels (225-litre barriques) - more oxidising as greater proportional surface area exposed. No more than 2 years in barrique.
- Larger vessels - longer maturation potential
- If container not completely full = more oxygen/effect enhances (ie Oloroso Sherry) - caramel/toffee
- Too much oxygen - no fruit/stale - not fit for sale

Sulfur dioxide

- **Antioxidant** and **antiseptic** (indispensable/must be used)
- Upper levels of SO_2 controlled - too much is toxic
- SO_2 produced naturally in fermentation
- SO_2 kept low = too much and wine is harsh/lacks fruit

_____*Antioxidant effects*

SO_2 protects grapes from oxygen - becomes 'bound' - must be replenished/monitored

Antiseptic

SO_2 can be toxic to yeast/bacteria (unwanted flavours) - main yeast in winemaking can tolerate levels of SO_2 toxic to other species.

Oak vessels

- Fermentation and maturation
- Tannin from oak - adds structure + textural complexity (toast/vanilla/smoke/cloves)
- Hygiene essential (no yeast/mold/bacteria)

Four factors to consider:

1. **Species and origin of oak**

   European vs. American (France considered finest)

2. **Size**

   Small vessels - larger surface area - greater effect (225-litre *barriques*/228-litre *piece*)

3. **Production of oak barrels**

   Toasting (staves heated to bend) transforms tannins/flavour compounds (sweet spice/toast)

4. **Age**

   Toasting diminishes after each use - cask with 4+ uses has no more flavour/tannin to impart

Oak alternatives

- Oak chips/staves = cheaper
- Oxidative effects - can add small, controlled amount of oxygen

Inert Winery Vessels

Stainless steel

- Stainless steel/concrete
- Fermentation (can be used also as storage)

Concrete vessels

- Lined with inert epoxy resin (waterproof)
- Harder to clean
- Keeps temp consistent during fermentation without cost of additional equipment

(Glass bottles also inert vessels - storage + maturation)

Grape Processing

Grapes get first dose of SO_2 upon arrival at winery
Sorted by hand (individual grapes) if premium - (not used for high-volume).

Destemming and crushing

- Machine harvested = no stems
- Stems removed by machine that can also crush
- **Crushing = breaks skin from juice (free run juice)**
- **Avoid seed damage** (bitter oil/tannin)

Pressing

- **Pressing = separating liquid and solid constituents of grape**
- White grapes - pressing before fermentation / black grapes - pressing after fermentation
- Gentle pressing to keep seeds undamaged
- Vertifical 'basket' presses (old method) - vertical press using a plate was raised/lowered by level (still happens in Champagne)
- **Pneumatic press** (newer method) - **inflatable rubber tube with a perforated, horizontal stainless steel cylinder** - larger area/more controlled. Closed tank to minimise oxygen.
- Fractions = separate liquid into different, individual pressings.

Adjustments

Made before/during/after fermentation
Grape juice = must

Sugar and alcohol

- **Enrichment = RCGM (rectified concentrated grape must) added to the must (before or during fermentation) - more sugar for yeast to convert to heighten alcohol.**
- **Chaptalisation = sugar (not from grapes, ie sugar beet) added to must.**
- Remove water - concentrates sugars - wine higher in alcohol/ also concentrates faults and reduces wine volume

Acid

- **Acidification = addition of tartaric acid in powder form** (used in hot climates)
- **Deacidification = acid neutralised by addition of alkali** (used in cool climates)

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Fermentations

Alcoholic fermentation

- Yeast + sugar = alcohol + CO_2 (+ heat/flavours)
- **Saccharomyces cerevisiae = common winemaking yeast**
  - Tolerates high alcohol/SO_2
- Alcohol fermentation will not start is temp below 5°c - will continue until all sugar consumed
- Alcoholic fermentation stops before all sugar consumed if (a) no nutrients left (besides sugar) and (b) temp above 35°c
- If sugar too high = yeast may struggle to start fermentation process
- If WM wants to keep some sugar - fermentation stopped by killing/removing yeast
- Yeast removed by filtration - after fermentation is halted by chiling to below 5°c.
- Control fermentation = choice of yeast/temperature management (more below)

Yeast

Ambient yeast (in grape bloom/in winery)	**Cultured yeast** (individual strains of S. Cerevisiae)
• Complex flavours • Cannot control which yeasts • Variation between batches • Unsuitable for high volume	• Performs well • Attractive flavours • Limits potential complexity of the wine

Temperature

- Too hot = yeast killed
- Fermentation temperature low - keep aromatic flavours (white)
- Fermentation temperature higher - extract colour/tanning (red)
- Excess heat removed by pumping over

Malolactic fermentation (MLF)

- **Malic acid → lactic acid**
- Reduces acidity/adds buttery flavours + CO_2
- **MLF encouraged by raising temperature and not adding SO_2 after fermentation**
- Avoided by cool temp/SO_2 use/filtering out bacteria

Pre-bottling maturation and blending

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Lees

- Cloudy - dead yeast cells/grape fragments
- Over hours, these falls to bottom of the vessel
- **Gross lees = unpleasant aromas/flavours**
- **Fines lees = (smaller particles) removed gradually**
    - In contact for extra flavour/rich texture

Pre-bottling maturation

- Primary fruit flavours - bottled after a few months (stored in stainless/inert)
- Tannin/alcohol/acidity/flavour benefit all needed for longer aging potential
- If aging/maturing - vessel flavours (oak/oxidation) + sediment depositing - all potential.

Blending

- Applicable to single variety + blend
- Usually after or during fermentation
- Potential for local winemaking constraints

Balance

- Adjust balance to enhance quality (ie, red wine - free run wine + press wine = higher tannin).

Consistency

- Consistency amongst bottles vital
- **Small barrel wine - less consistent -** can be moved to a large vat to smooth/blend
- Blending required if variations in fruit (different vineyards/harvesting) + slight inconsistencies

Style

- Blend to a consistent, yearly 'house' style - ie, press fractions/ fermentation or maturation in different vessels/ only portion of wine MLF.
- Different grape varieties/vintage/vineyard to achieve their own style.

Clarification

Fining

Fining agent added to cause constituents to clump into larger forms - removed by filtering.
Widely used - although some winemakers believes effects flavour/texture.

Sedimentation

Racking = wine pumped into different vessels to remove gross lees. Repeated racking to remove sediment. (**Centrifuge - machine to speed up racking process** - expensive.)

Filtration

Process of removing gross + fine lees (after fermentation/during maturation).

- Depth filtration: thick layer of material - suitable for filtering gross lees.
- Surface filtration: fine sieves - expensive + clog up easily. Used after depth filtration.
- Sterile filtration: also removes yeast/bacteria with pores small enough to still be present in wine.

Stabilisation

Change in slow, predictable manner (ie, Port 50-60 years of aging)
Fining - adds clarity - seen as stabilisation technique
Other important areas that require stabilisation:

- Tartrate Stability
  - Tartaric acid less soluble in wine than grape juice
  - Forms crystals called **tartrates** - coloured by wine/harmless/flavourless - ruin look.
  - Develop with long maturation in cellar / cool temperatures
  - To remove, **WM chill wine to 0°c + filter out**
- Microbiological Stability
  - Yeast/bacteria can spoil a wine - equipment must be kept clean.
  - Fortified wines (high alcohol) and MLF (alcohol, acid, lack of nutrients) - resistant to microbiological spoilage.
  - **No MLF/low-med alcohol/low acid/little residual sugar - at risk of spoilage**
  - **SO_2 and sterile filtration to avoid.**
- Oxygen stability
  - Oxygen dissolved in wine/enters through packaging
  - **Keep SO_2 topped up to avoid**
  - Bottles finished with CO_2 or nitrogen before filling to eliminate oxygen.

Packaging

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Bottles and alternatives

Glass bottles	Plastic bottles	Bag-in-box
• Portable/cheap to produce/strong/air tight • Rigid/heavy/weight adds to transport costs • To lower cost - some producers pack wine in the country which it's sold. • After open - vulnerable to oxygen.	• Lighter • Not airtight - air through plastic	• Bag collapses to prevent air entering • Some air - wall of bag - consumed in 18 months.

Closures

- Protect wine from harm until consumed
- Must consider - ease of use/bottling/manufacturing line
- Small oxygen - positive tertiary flavours
    - **Cork**
        - Popular, original wine closure, balance of small oxygen for tertiary development
        - TCA (Trichloroanisole) - chemical present in some corks (stale/mouldy cardboard)
    - **Synthetic cork**
        - Made from plastic
        - Consumer within a year - some premium brands use
    - **Screw caps**
        - Aus/NZ used widely
        - No taint/strong seal from air
        - Preserve primary fruit
        - Some now permit oxygen for tertiary development

Post-bottling maturation

- Most wines to be consumed within year
- Some wines mature in bottle (Port/German Rieslings/cru classes Bordeaux)

- Age undisturbed/cool (10-15°c)/dark/constant humidity/on its side/etc.