IDENTIFYING AND MANAGING COMMON CELLAR CONCERNS: *VIA WINE FINING*

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FINING- IS IT NECESSARY?

- At completion of alcoholic fermentation, wine becomes a colloidal solution as well as a colloidal suspension
- Natural sedimentation, centrifugation and clarification with filtration do not protect wine against colloidal hazes
- Fining plays a role in wine stability

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FINING WINE

- Clarification
  - Remove suspended particles, eliminate haze
  - Enhance filterability
- Stabilization
  - Avoid precipitation, preserve color
  - Reduction of microbial load
- Organoleptic Improvement
  - Remove undesirable components
  - Reveal masked components

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FINING OPTIONS

- Static settling and racking
  - Success is wine dependant
    - Dry whites and reds
    - Sweet wines

On occasions a wine will not clarify via static settling!

WHY?

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ENOLOGICAL BASED FINING OPTIONS

- Enological based fining agents
  - Proteins
  - Earths
  - Synthetic Polymers
  - Colloids

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MECHANISM OF FINING

- Electrical Interaction
- Bond (Hydrogen) Formation
- Absorption
- Adsorption

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THE PROTEINS

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PROTEINACEOUS FINING AGENTS

- Traditional agents used

- Gelatins, Isinglass, Casein, Milk, Egg Albumen
  - Major difference between proteins- MWt and amino acid composition
  - Higher pI than wine= limited solubility
  - Carry an overall positive charge

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GELATINS

- Origin
  - Produced from the (almost)complete hydrolysis of collagen from skin and bones
  - Production method dictates their formulations
  - Different proteins= different side chains= different reactions
- Properties
  - Mechanism- Hydrogen Bonding
  - Heavy bulky lees, use in conjunction with silica gel
  - pI of pH 4.7
- Use: Whites, Rosés, Reds (juice or wine)
  - Astringency, unmask positive aromas, reduce moldy characteristics, clarification (juice and wine), settle out microbes

GELATINS cont.

- Specific notes
  - Over-fining
    - Use co-fining aid (tannin or silica gel)
  - Thermo-stable (protein stability test)
  - More efficient at cooler temperature
  - Flocculation occurs rapidly, but sedimentation may take longer
  - Rack of lees once sedimentation has occurred
  - Filtration (pad) can occur 48-72 hours post treatment

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ISINGLASS

- Origin
  - Protein from the swim bladder of fish (Sturgeon)
- Properties
  - Net positive charge at wine pH
  - Forms compact lees, but can be significant
  - Slow to settle
- Use: Whites, Rosés and Reds!
  - Brilliance, unmask aromas, soften harshness, improve filterability of botrytised grapes

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CASEIN

- Origin
  - Mixture of milk proteins (from skimmed milk)
- Properties
  - Net positive charge
    - If blended with Potassium Bicarbonate enhances the solubility
  - Must be completely homogenized (rapidly)
  - Flocculation and absorbtion then precipitation
  - Medium lees volume
- Use: Whites, Rosés
  - Reduce bitterness and oak character, remove color (brown and pink) pigments, can reduce Cu, enhance clarification, (over) pressed white juice

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EGG ALBUMEN

- Origin
  - Protein from Egg Whites (fresh, frozen or freeze dried)
- Properties
  - Net positive charge at wine pH
  - Precipitates into compact deposit
- Use: Aged reds
  - Red wine to “polish”
  - Remove bitter polyphenolics
  - Softens astringency

Must counter-fine if used in white wines- not recommended

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RECOMMENDED ADDITION RATES

Agent	White Wines	Red Wine	Contact Time (min/ max)
Gelatins-Liquid Gelatins-Hot water soluble	300-600ppm N/A	500-1500ppm 50-100ppm	7/21 days
Isinglass	15-30ppm 0.12-0.25#/K	N/A	10/28 days
Casein	20-100ppm	50-100ppm	2/15 days
Albumen	N/A	50-150ppm (1-3 fresh egg white/225L barrel)	5 days/21 days

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THE EARTHS

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EARTHS

- Bentonite
  - Volcanic Clay (mineral)
    - Classed as a Montmorillonite
  - Complex of hydrated aluminium silicates with exchangeable cationic components
    - Exists as small plates
  - When rehydrated enormous surface area (300-900m^2/g)
  - When in solution it acts as a multi-plated negatively charged structure that can exchange cations with positively charged components in juice or wine

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BENTONITE

- Available in 2 major forms
  - Sodium and calcium
- Sodium is preferred due to superior swelling abilities
- For rehydration/swelling follow manufacturers guidelines
  - Without any deviations!
  - Proper mixing is essential
- Fast reacting (minutes)
- Allow a week to settle (depending on tank height)

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PROBLEMS WITH BENTONITE

- Large loss in lees
  - 5-20%
    - If you need to compact lees more try aqueous solution of Silicon Dioxide or Gelatin
- Take care with sparkling wine production
  - Removing all the proteins makes it difficult to establish a quality mousse
- Reputed to alter the organoleptic quality of your wine
- Can pick up “cellar” odors, store in a clean dry environment

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RECOMMENDED ADDITION RATES

Agent	Juice	Wine	Contact Time
Bentonite	0.5-2#/K	1-5#/K (sometimes more)	5-14 days

- Can add bentonite to juice
  - 2#/1000gals removed problematic proteins"(ASEV student paper for problematic SBL vyds in Edna Valley, CA)
  - Can remove herbaceous aromas
  - If treat pre-fermentation, generally need less than if only doing a post fermentation addition
  - Can ferment on bentonite
    - However, this will reduce your YAN
      - Make adequate adjustments to secure your fermentation

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OTHER OPTIONS FOR PROTEIN FINING?

- Tannins do have protein binding ability
  - Binding of proteins during fermentation has also been shown to lower the final amount of bentonite needed
- Lees aging (Mannoproteins)
- Neither as effective as bentonite

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THE SYNTHETIC POLYMERS AND COLLOIDS

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SYNTHETIC POLYMERS

- Origin
  - Polyvinylpolypyrolidone (PVPP)
    - Protein like fining agent with selective affinity for low MWt phenolics
      - Catechins and anthocyanins
- Properties
  - Insoluble in water and wine
  - Flocculates
- Uses: Juice or wine
    - Bitterness , astringency and color adjustments (pink and brown pigments)

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RECOMMENDED ADDITION RATES

Agent	Juice	Wines	Contact Time
PVPP	400-800ppm 3.3-6.7#/K	150-500ppm 1.25-4.2#/K	10-21days

Must be removed from wine via filtration (ttb)

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COLLOIDS (POLYSACCHARIDES)

- Alginate (Sparkolloid)
  - Enhances clarity and filtration
    - Different formulation due to solubility in alcohol
      - pH independent strong positive charge
      - Helps to settle out finely suspended particles
        - » Protective colloids
- Gum Arabic
  - Disruption tartrate crystal formation
- Mannoproteins
  - Yeast autolysis

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RECOMMENDED ADDITION RATES

Agent	White Wines (ppm)	Red Wines (ppm)	Contact Time
Gum Arabic	440-1320ppm	440-1320ppm	No racking
Alginates- Cold Mix	125-250 ppm 1-2#/K	N/A	7-14days
Alginates- Hot Mix	125-500ppm 1-4#/K	125-500ppm 1-4#/K	7-14days

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BLENDED FINING AGENTS

- Casein & Bentonite
- Casein & PVPP
- PVPP & Bentonite
- …

Synergistic effect!

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OTHERS

- Silica Gel, Carbon, Copper and Tannins
  - Silica Gel
    - Prevents over-fining
  - Carbon
    - Deodorizing and decolorizing carbons available
  - Copper
    - Sulfide issues
  - Tannins
    - Co-fining agent with proteins (mainly gelatin)

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CONDITIONS FOR SUCCESSFUL FINING

- Low in dCO_2/gases
  - Presence/ evolution of gas will keep particles in suspension/Delay settling
- pH
  - Lower the pH= less fining agent required for clarification (gelatins)
- Metal content
  - Influence the activity and flocculation
- Temperature
- Absence of protective colloids

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CONDITIONS FOR SUCCESSFUL FINING…

- Choice of agent
- Preparation of agent
- Concentration of agent
- Previous treatments

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FINING AGENT COMPARISON

Color Reduction	Tannin Reduction	Volume of Lees	Clarity & Stability	Potential to Overfine	Quality Impairment
Carbon	Gelatin	Bentonite	Bentonite	Gelatin	Carbon
Gelatin	Albumen	Gelatin	Carbon	Albumen	Bentonite
Casein	Isinglass	Casein	Isinglass	Isinglass	Casein
Albumen	Casein	Albumen	Casein	Casein	Gelatin
Isinglass	Bentonite	Isinglass	Gelatin		Albumen
Bentonite	Carbon	Carbon	Albumen		Isinglass

- Decreasing order of activity and effectiveness.
- Dependant upon wine the agent, method of preparation and addition, concentration, pH, metal content, temperature, age, and previous treatments.

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FINING CONSIDERATIONS

- Lack of specificity
- Over-fine
- Oxygen exposure
- Lees volume (loss of wine)
- Stability considerations
- Expense
- Lab trials

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BENCH TRIALS

- Essential
  - No relationship between amount of agent used and amount of compound removed
    - Simulate cellar conditions
- Determine/observe
  - Flocculation time
  - Settling speed
  - Resultant clarity
  - Volume and quality of Lees
  - Organoleptic effect

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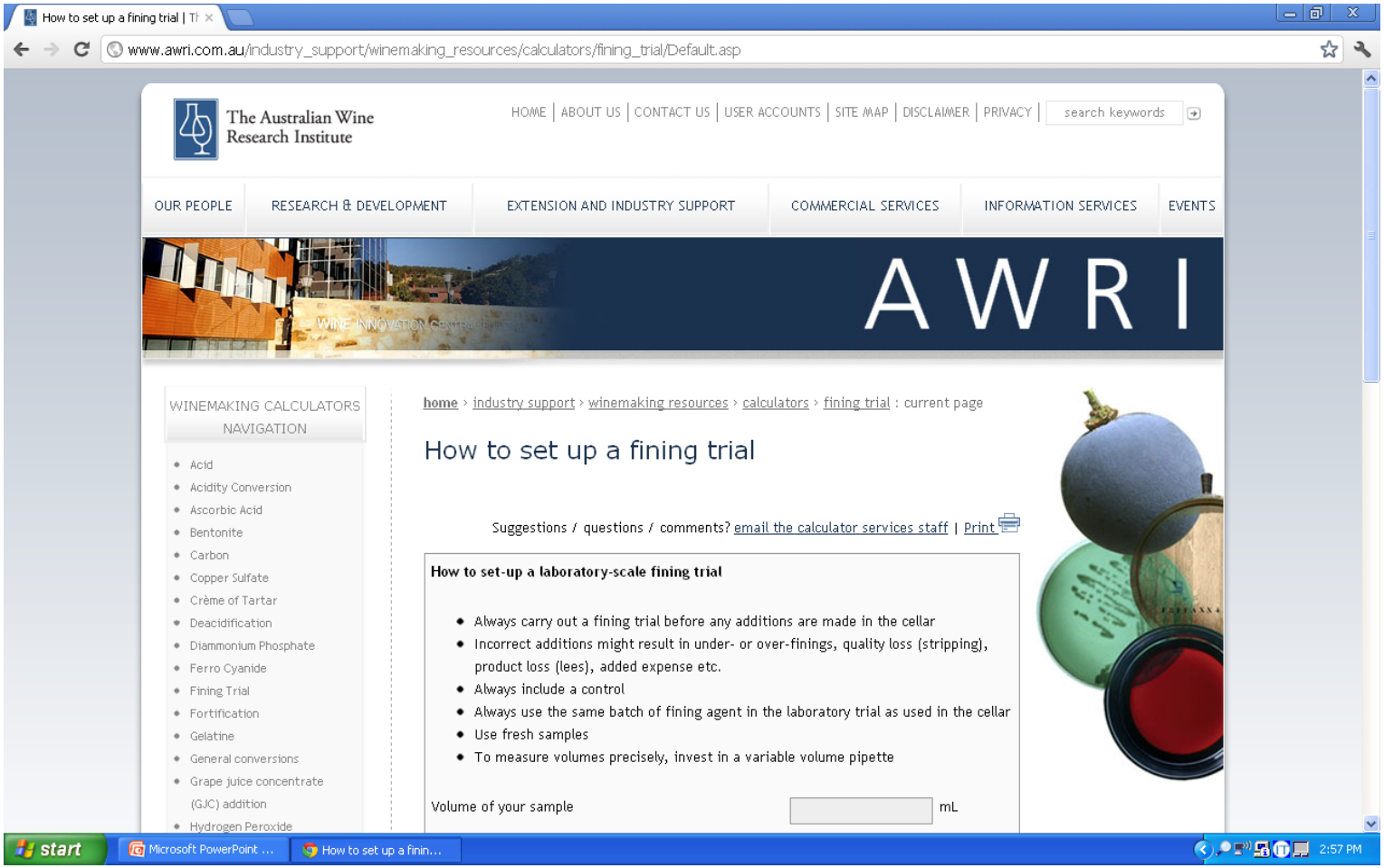
USEFUL TOOLS



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PREPARATION OF FINING AGENTS

- Prepare in water (never wine)

- Rapid mixing
  - Consequences: coagulation of agent before coming into contact with wine

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CELLAR TREATMENTS

- Prepare in water
  - Never wine
    - as reaction between fining agent and wine will occur, leaving wine to be treated with compromised fining agent
- Rapid mixing of prepared agent into whole volume of wine
  - Consequences
    - Product coagulation prior to addition
      - Product efficacy compromised/reduced
- Tanks v. barrel additions
- Do I really have to rack?

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FUTURE OF FINING AGENTS

- Allergen labeling
  - Still to be determined exactly when
- Non-allergenic fining agents
  - Not approved for use yet!

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POST FINING

- Protein stabilization
- Tartrate stabilization
- Filtration
- Bottling

- Enjoying!

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THANK YOU

QUESTIONS

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