Your Small Winery Lab

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Goals

- Understand why we test
- Understand ideologies of testing
- Review the equipment and analyses
- Stress importance of tasting with your lab results

Why Test In Your Winery

- Maintaining wine quality
- Provides information for additions/treatments
- Compliance requirements
- Faster turnaround time
- Cost control???

Random and Systematic Error

- Random error is attributed to events unrelated to the actual chemical reaction
- Systematic error is inherent in the method you have chosen.

Accuracy and Precision

How do I know my results are “good”??

- See if someone else got the same number?
- Use a method from a book/reference?
- The results seem “right”?
- Get the same result several times?
- Use the same method as someone else?

Common Issues

- Sampling
- Sample prep
- Analytical Technique
- Headspace after sampling
- Result Interpretation/Comparison
- Test Choice

Sampling & Sample Preparation

- Be Consistent and sample at appropriate times
- Make sure headspace is not compromised after sampling
- Keep conditions sanitary
- Most samples should be clear
- Degassing to reduce the effects of CO2

Essential Testing

Bare Bones

- Brix (°B)
- Temperature
- pH
- Titratable Acidity (TA)

More complexity

- Malic Acid (HMa)
- Alcohol (EtOH)
- Volatile Acidity (VA)
- Sulfur Dioxide (SO2)
- Residual Sugar (RS)
- Hot/Cold Stability

Equipment and Glassware

• Hydrometer/Refractometer	• $15 -130
• pH Meter	• $50 and up
• Pipettes	• Depends
• Burette	• $50 ish
• Flasks, Beakers	• $5-10 ish
• Analytical Balance	• $250
• Ebulliometer	• $1500-$3000
• Cash Still	• $1000

Chemicals/Kits

- Don’t over purchase
- Maintain integrity of the content in the original container
- Refer to manufacturer’s requirements for storage (Iodine, H_2O_2)
- Reagents are standardized and ready to go if stored properly

Brix

- Refractometer
- Hydrometer

Refractometer

- Samples should be free of bubbles
- Temperature compensated
- Check Zero and with a known standard.

Hydrometer

- Brix and Temperature are directly related
- Samples should be clear and free of bubbles

pH

- Levels dependent on varietal/style
- Simple yet complex
- Calibration
- Buffers
- Result interpretation

Titratable Acidity

- Sample preparation
- Endpoint choice
  - Phenothalein/pH 8.2

Residual Sugar

- Sugar Pill (Clinitest)
- Based on an old alkaline copper reduction method.
- Better for whites than for reds
- Gold Coast and enzymatic methods are complex and require more advanced equipment.

Malic Acid

- Paper Chromatography ~$100/Kit
- LOD of ~100 mg/L
- Controlled spotting
- Organic waste
- Enzymatic method is complex and require more advanced equipment

Alcohol

- Specific gravity
  - Alcohol (%v/v) = (SG1-SG2)/0.0074
- Distillation
- Vinometer
- Ebulliometer

Ebulliometry

- No sample treatment unless RS>2%
- Based on the boiling point of wine versus that of water.
- Use cold water in the condenser
- Clean out chamber periodically

Volatile Acidity

- Sample/Still Prep/Vent
- Distillation than titration of the distillate
- SO_2 will also interfere

The Cash Still

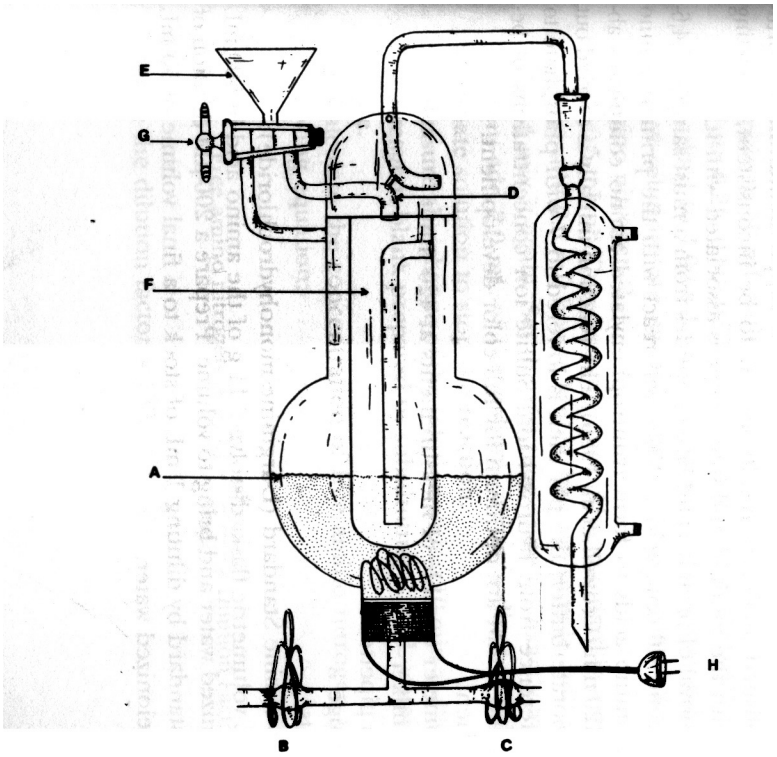

Fig. 20–2. Cash and Markham Volatile Still Assemblies for Volatile Procedure.

Sulfur Dioxide (SO_2)

- Ripper Method
- Aeration Oxidation

Ripper

- Volatile – Test first!
- Whites versus Reds
- Free and Total
- Re-dox reaction – Endpoint is dynamic
  - Starch endpoint is difficult to see in Red
  - Can’t use if you have used ascorbate
- Platinum electrode option
- Results interpretation

Aeration Oxidation

- Advanced
- Sample
- Free and total require different methods
- Aspiration rate and condenser temperatures are critical

Hot/Cold Stability

- Turbidity Meter ~$400 - 1000
- Hot Water Bath ~$250
- Conductivity Meter and Probe
  - ~$ 200-600

Commercially Available Equipment

- Vinmetrica ~$Varies
  - pH, TA, SO_2
- Hanna F/T SO_2

Kits

- Quick and Dirty
- Limitations
  - Single Use
  - Assume reactions are finite
  - Costs
- Chemistry Background Helps A lot!

Confidence in Results

- How do you develop confidence?
  - Occasional comparison with commercial lab
  - Results follow a logical pattern of cellar activities

Recommended Reading

- **Wine Analysis and Production, Zoeklein, et.al. Chapman and Hall (Aspen)**
- **Techniques for Accurate Chemical Analysis of Grape Juice and Wine, Illand**