Rotting Grapes to Perfection: Winemaking

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Who I am and how I got here

Grew up in Auckland, New Zealand, on a Dairy farm
How I got here

Soil microbiology class got me interested in microbiology
Completed my M.S. in microbiology and PhD in Food Science researching wine microbiology
What am I doing here?

• Associate Professor in Food Sci and Tech Dept - OSU
• Research
  • Wine microbiology and the fermentation process
• Teaching
  • Wine Production
  • Wine analysis and sensory evaluation
• Extension
  • Link between University and Oregon wine industry
  • Technical support
  • Educational programs
Outline

• Overview of winemaking
  • Red vs. White winemaking
• Oregon wine industry
  • What makes us unique?
• Role of research
Grape processing

Fermentation

Post-fermentation processing

Aging, filtering, bottling

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Harvesting
- Hand harvest
- Machine harvest
Fruit processing

At the crush pad
- Weighing
- Sorting
- De-stemming
- Crushing
- Additions
De-stemmer
Red vs. white winemaking

Red grapes transferred to tank and fermented with skins and seeds
White grapes pressed to extract juice – juice only fermented
Rose/blush wines
Red grapes pressed after period of skin contact – small amount of color extraction
Can also be produced by blending red and white wine
Winemaking – fermentation 101

Sugar + Acids + Flavors + Phenolics = LOTS OF STUFF HAPPENS

Ethanol + CO₂ + Acids + Phenolics + Flavors and Aromas

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It’s a jungle in there

• Raw material for winemaking not pasteurized
  • Contrast to beer or cheese production
  • Luckily grape juice/wine is such a harsh environment that only select microbes can survive and grow
  • No pathogens!!
Basket press
Membrane/Bag press
Winemaking

Grapes

Crushed/Destemmed

Must/Juice

Alcoholic fermentation
White wine fermentation

After pressing juice often cold settled
Sugar and acid adjustments
- Fermentation in closed tanks typically at cooler temperatures – 55 to 60 °F
  Retention of desirable aromas
Barrel fermented Chardonnay an exception
Red wine fermentation

Color (anthocyanins) and mouthfeel (tannins) compounds present in skins and seeds

Higher temperature and ethanol increases extraction

• Fermentation temps. 80-90°F

Requires mixing of “cap” to promote extraction and prevent high temp or spoilage
Winemaking

Grapes

Crushed/Destemmed

Must/Juice

Alcoholic fermentation

Malolactic fermentation
Winemaking

Grapes

Crushed/Destemmed

Must/Juice

Alcoholic fermentation

Malolactic fermentation

Ageing, Stabilization
Post-fermentation processing - Reds

Barrel aging
Oak barrels ideal storage vessels
Oak aroma/flavor
Improves mouthfeel – softens
Flavor development
Barrels

Barrel staves are shaped and formed inside hoops and toasted with flame – various toast levels
Bottles and closures

Bottle shapes and colors

Bag-in-box

Cork – cork taint issues

Synthetic cork – lower quality, sealing issues

Screw-cap – public perception
Oregon Wine Industry
Oregon wine industry

• Oregon 3rd most wineries, 4th in production
• BUT....... CA accounts for 90% + of US wine production
• 600+ wineries – average 5000 cases (3 million total)
  ➢ Gallo 70 million cases
  ➢ 3600 wineries in CA
  ➢ 240 million cases CA
• New Zealand – 28 million cases
• Australia – 136 million cases
Winery or Refinery??
How does the Oregon wine industry survive?

• Cannot compete on volume
  • Climate does not allow full ripening of large crop
• Oregon industry based on smaller, family owned producers
  ➢ Focus on premium quality & premium price
  ➢ Avg. price grapes per tonne = $2300 vs $713 for CA
  ➢ Approx 60% Pinot noir
  ➢ 60% of grapes grown in Willamette Valley – growing acreage in Sth Oregon and Columbia Gorge
Role of Research in Oregon Wine Industry

• OSU has long history of conducting industry directed and funded research projects

• Oregon Wine Research Institute made up of scientists from Oregon State University and USDA-ARS
  • Soil science, plant pathology, plant genomics and metabolomics, plant physiology, entomology, microbiology, analytical chemistry, sensory

• Collaboration with colleagues at a number of US and International Universities and Research Institutes
Role of Research in Oregon Wine Industry

• Oregon wine can only compete in the ultra competitive wine market environment because of premium quality products.
• What is unique about Oregon wines?
• How can this be harnessed?
• Research strives to better understand quality factors and provide vineyard managers and winemakers with the tools they need.