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HARD CIDER PRODUCTION NUANCES

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- Cider and Perry can be broken down into 2 primary classes of products:
 - Standard (i.e., New World, English, French)
 - Specialty (everything else)
- In general, the production of hard cider goes as such: Pressing Apples → Clarification → Racking → Inoculation → Primary Fermentation → MLF → Oak Aging → Stabilization → Bottling

Pre-Fermentation Apple Juice Chemistry

- Sugar: Most apples come in at 1.045 SG (11.43° Brix, or 5.75% potential alcohol)
 - Ideal: 1.060+ SG (14.74° Brix, or 7.67% potential alcohol)
 - Legalities and labeling requirements around final alcohol content
- Acid: Primary acid in apples is malic.
 - Little buffering capacity in apple juice.
 - Primary fermentation will contribute small concentrations of lactic and acetic acid.
 - Ideal hard cider pH: <3.8
 - Ideal hard cider TA: 4.5-7.5 g/L malic acid
- Yeast Assimilable Nitrogen (YAN) should be between 150-200 mg N/L
- Pectin Clarification
 - Pectinase Addition
 - Depectinization: Pectinase + Sparkolloid
 - Keiving

Yeast Selection

- Native Yeast
 - Saccharomyces
 - Non-Saccharomyces and spoilage yeasts
 - Slow initiation
 - Pasteurized juice or juice treated with SO₂ will likely not ferment through spontaneous fermentation
 - Commercial Yeast Strains: Making Decisions
 - Consider juice chemistry
 - Primary objective: complete the fermentation successfully
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- Consider your hard cider style goals
 - Evaluate production techniques available to you
 - Decide on whether or not you will undergo MLF with that cider
- Nutrient Management during Primary Fermentation
 - Natural variability in YAN for each fermentation
 - YAN affects fermentation kinetics
 - YAN influences aromatics and flavors

Monitor Primary Fermentation

- Temperature Control
 - Controls spoilage
 - Influences rate of fermentation
 - Maintains aromatics and flavor
 - Provides a tool for stylistic variability
- Monitor sugar and temperature daily
- Resources are available for stuck fermentations. Check your supplier handbook (e.g., Scott Labs)

Malolactic Fermentation (MLF) and Hard Cider

- Remember about 90% of the hard cider acid is composed of malic acid, and one can assume that malolactic bacteria are naturally present in hard cider.
- MLF can be positive and there are a number of ways to use MLB strains to one's advantage
 - Inoculate after primary fermentation
 - Inoculate during primary fermentation
 - Blending hard ciders
- Some MLB strains can contribute to a hard cider's spoilage.
- MLB strains can be inhibited by free sulfur dioxide and temperature control.
- Ciders that undergo partial-MLF should be filtered before bottling.

Oak aging and Stabilization of Hard Cider

- Use of oak barrels with hard cider
 - Difficult to clean and sanitize
 - May allow spontaneous fermentations
 - Contributes tannin and mouthfeel constituents
 - Oak flavor integration
 - May lead to spoilage. Monitoring is essential.
- Use of oak chips (dosage is usually around 160 g/5 gal)
 - Oak flavor integration
 - Less expensive
- Microbiological Stabilization
 - Sulfur Dioxide
 - Addition based on pH
 - Ideal: 0.85 ppm molecular SO₂ additions
 - Potassium Sorbate

- Maximum dosage in hard cider: 275 ppm potassium sorbate
 - Often used in hard ciders with residual sugar
 - Flavor association with degradation
 - Sterile Filtration
 - Removes microorganisms from hard cider
 - Should perform a bubble point test to ensure efficacy
 - With proper SO₂ treatments and sterile filtration, do not need potassium sorbate additions
 - Bottle Pasteurization
 - Usually completed in batch processes
 - May degrade aromatics
- Chemical Stabilization
 - Hazes: try to prevent by treating the juice
 - Pectic enzymes
 - Bentonite and Sparkolloid
- Spoilage and Faults
 - Hydrogen Sulfide
 - Brettanomyces off-flavors (Phenolic)
 - Mousiness
 - Volatile Acidity (Acetification)
 - Oxidation
 - Diacetyl
 - Cider Sickness

Hard Cider Supply Companies

Aftek (aftefilters.com)
 ARS (arsenterprises.com)
 BSG (beveragesupplygroup.com)
 cidersupply.com
 Enaris USA (enartisvinquiry.com)
 G&D (gdchillers.com)
 Kaufman Container Co. (kaufmancontainer.com)
 Laboratories Standa (www.standa-fr.com)
 Oesco (oescoinc.com)
 Scott Labs (scottlab.com)
 Vin Table (vintable.com)
 Wine Tapa (winetapa.com)

Are you integrating hard cider production into your winery? Do you need help improving your hard ciders? Check out Denise Gardner Winemaking (www.dgwinemaking.com) for production information, including a (free!) weekly blog series, and wine consulting service packages. Or email me directly at denise@dgwinemaking.com for more information.