Basic Laboratory Analysis of Fruit for Cider Making

Cider Apple Production in Vermont: Market Opportunities and Technical Challenges
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Vermont Hard Cider Company
Cider is what we do!
Components of Apples & Cider

APPLE COMPONENTS

CIDER COMPONENTS

Apple Juice – 90% Water and 10% Solids
Sugars – 80% of total soluble solids
Acids – Mainly Malic Acid, plus some other organic acids
Nitrogen – Ranging from 40-350 ppm, mostly amino acids
Tannins – Phenolic compounds associated with astringency and bitterness. Low in desert apples, higher in bitter varieties
Aromas & Flavors – Varietal specific
Vitamins & Minerals – B-vit, plus some mineral salts
Starch – Accumulated early, then converted to sugars
Pectin – Affects pressing & filtration

*Viney M. (2007). The Virtual Apple Parer Museum
http://appleparermuseum.com
Starch-Iodine Index

**STARCH-IODINE INDEX PROCEDURE**

- Use a fresh iodine solution
- Pick 10 representative apples
- Cut in half through the equator
- Dip half of the apple into solution
- Wait 1 minute for starch patterns to develop
- Arrange apples in order from darkest to lightest
- Compare to patterns with picture to approximate S-I Index
- Calculate an average index number.
- Example when McIntosh changes from 60-40% stain (5 to 6) it is ready to be picked.
- Varies by Variety – Empire 4.5-5.5, Idared 2.8-3.5

*Blanpied and Silsby (1992)*
Firmness

**FIRMNESS TESTING PROCEDURE with a PENETROMETER**

- A measure of ripeness and condition
- Use plunger with 7/16-inch (smaller one used for pears)
- Calibrate with accurate scale
- Collect representative sample of 10 apples of similar diameter
- Slice cheek of apple (green and blush sides)
- Push until line on plunger is level with outer flesh (2 seconds)
- Read gauge in lbf or N
- Take 2-3 tests per apple
- Sources of Error
  - Wide variation (3-4 lbs by professional users)
  - Nitrogen levels
  - Water Core
  - Water loss

*Blanpied (1977)*
Harvest for Eating or Harvest for Cider Making?

*Blanpied and Silsby (1992)*
Ideal Cider Chemistry?

Depends on Style

• High Fermentable Sugars – 11 to 15 Brix
• Good Acidity – 5-6 g/L T.A. as malic acid
• Stable pH – 3.3-3.7 (above 3.8, cider becomes unstable)
• Tannin – none to plus 2 g/L
• Nitrogen 75 mg/L to 150 mg/L
• Thiamine >0.2 mg/L
• Pantothenate >0.2 mg/L
Sugars – Refractometer & Hydrometer

**BRIX HAND REFRACTOMETER**

- Calibrate at room temperature
- Juice a representative sample of apples
- Deposit juice sample onto prism
- Correct for temp.

*Vasquez and Mueller (http://ucanr.org/sites/viticulture-fresno/files/115503.pdf)*

**BRIX HYDROMETER**

- Put 220 mL juice in 250 mL cylinder
- Suspend hydrometer in sample and gently spin to read measurement
- Measure sample at 68°F or correct for temperature
- CO₂ can interfere with sample. De-gas if necessary


*CIDER IS WHAT WE DO!*
Acidity – Titratable Acidity (T.A.)

• Obtain 50 mL clear juice
• Measure at room temperature
• Pipet 10 mL juice into flask
• Add phenolphthalein indicator
• Titrate with 0.1 N NaOH solution to endpoint

T.A. (as g/L malic acid) = mL NaOH x 0.67

\[ \text{g/L} = \text{ml NaOH} \times \text{normality NaOH} \times 0.067^{**} \times 1000 / \text{Sample Vol. (mL)} \]

**Equivalent weight of malic acid

Stability - pH

- Calibrate pH meter with pH standards
- Obtain 50 mL clear juice
- Pour sample into beaker and stir
- Read measurement once stable
- Correct for temperature

Taste, Taste, Taste!

DON’T FORGET…
TASTE YOUR APPLES
TASTE YOUR JUICE
TASTE YOUR CIDER

VERMONT HARD CIDER COMPANY LLC
CIDER IS WHAT WE DO!
Thank you!

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