Measurement of Fruit Juice Solids Content

Dana Krueger
Krueger Food Laboratories, Inc.

Presented at the TCJJP 2015 Fall Meeting in Los Angeles, 10/1/15
What is Brix?

• Brix is a measure of dissolved solids in sugar solutions including fruit juices
• It is based upon the specific gravity of sucrose in water solutions
• The Brix scale (°Brix) is based on density tables developed in the 1800’s by Adolf Brix
• These tables have been modeled mathematically as polynomial formulas
Approaches to the Measurement of Juice Solids

- Direct determination of moisture/total solids
- Correlation of juice solids with specific gravity/relative density
- Correlation of juice solids with refractive index
Direct Determination of Moisture/Total Solids

Vacuum Oven

Moisture Balance
Standard Methods for Direct Determination of Total Solids

- AOAC 920.151A_B (vacuum oven 70 °C)
- IFU Method 61 (vacuum oven 70 °C)
- EN 12145 (vacuum oven 70 °C)
- AOAC 985.26 (microwave drying - tomato products)
Correlation of Juice Solids with Specific Gravity/Relative Density

Pycnometers
Correlation of Juice Solids with Specific Gravity/Relative Density

Hydrometer Spindles

Photo Credit: indiamart.com
Correlation of Juice Solids with Specific Gravity/Relative Density

Oscillating U-Tube Density Meter

Photo Credits: anton - parr.com
Standard Methods Using Specific Gravity/Relative Density

• AOAC 920.151B (relative density by pycnometer)
• IFU Method 1 (relative density by pycnometer)
• ISO 2172:1983 (relative density by pycnometer)
• EN 1131 (relative density by pycnometer)
• AOAC 920.151B (relative density by spindle hydrometer)
• IFU Method 1A (relative density by oscillating U-tube density meter)
Correlation of Juice Solids with Refractive Index

Photo Credits: chemlab2.truman.edu

Photo Credits: sperdirect.com

Refractometers
Standard Methods Using Refractive Index

- AOAC 920.151B (soluble solids by refractometer)
- AOAC 932.12 (soluble solids by refractometer)
- AOAC 976.20 (soluble solids by refractometer with citric acid correction - lemonade)
- AOAC 983.17 (soluble solids by refractometer with citric acid correction - citrus juices)
- IFU Method 8 (soluble solids by refractometer - with citric acid correction for citrus juices)
- ISO 2173:2003 (soluble solids by refractometer)
- EN 12143 (soluble solids by refractometer)
Issues Relating to Measurement of Soluble Solids by Refractive Index

- Calibration based on RI of sucrose sol’ns
- Fruit juice results are only approximate
- Needs temperature control or correction
- Significant non-sugar components, especially acids, affect results due to different RI
- Acid correction – higher acid juices?, malic vs citric?
- Is correction needed? Or is measurement of uncorrected Brix sufficient for purposes of setting contractual specifications?
Acid Correction of RI Brix

- Large biases occur in high acid juices such as lemon and lime juice.
- Brix results for citrus juices, by convention, are typically corrected for acidity.
- Most non-citrus juices are not typically acid corrected.
- Is correction needed? Or is measurement of uncorrected Brix sufficient for purposes of setting contractual specifications?