Water Activity and Fungal Growth

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Equilibrium Relative Humidity & Water Activity

- Equilibrium relative humidity = headspace humidity above a product.

- Water activity = ERH/100
- 0.65 Aw = 65% ERH
Water Activity and Food Stability

- Lipid oxidation
- Non enzymatic browning
- Enzymatic browning
- Molds
- Yeasts
- Bacteria

Water Activity

- Relative Reaction Rate

- Low

- High

Graph showing the relationship between water activity and reaction rates for different foodborne processes.
Fungal Growth

1. ERH below 75 – 80% allows more time for drying.
2. ERH below 65% allows safe long-term storage.

Equilibrium Moisture Content

ERH & Moisture Content

Relationship affected by:

- Product temperature
- Adsorption/desorption (hysteresis)
- Cultivar
- Growing conditions
- Drying, particularly high temperature exposure

With an ERH/MC model determined for a particular grain sample, ERH will predict MC within ±0.5%¹

¹ Chen 2001
Measuring Moisture Content

• Fast measurement
• Low cost units, <$300, have an accuracy of ±0.5% to ±1.0% MC.
• Bench top units $2000 – $5000 have an accuracy of ±0.1%.
• Need separate calibration for each product and for each growing location.
• Important to obtain a representative sample.
DryCard

Equilibrium relative humidity calibration with saturated salts

useful range

25.0  32.7  43.2  58.3  64.5  75.3  84.7
Options for measuring ERH

- **DryCard**
  - $1 – 1.50

- **Hygrometer**
  - $3 - 10

- **Water activity meter**
  - $12,000
Measuring ERH

• Product has equilibrated after drying for 4 to 24 hr depending on particle size.
• Product has a uniform temperature.
• DryCard or hygrometer is exposed to product for 30 to 60 minutes for an approximate ERH determination.
• DryCard or hygrometer is exposed to product overnight for precise ERH determination.