



# Crossroads to Harvest

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# Influences Affecting Potato Sugar Content and Specific Gravity

Weather

Variety



Cultural Practices

Soil



# Weather (CGDD)

Cumulative Growing Degree Days (CGDD) are a useful measurement of how much heat your crop experienced.

CGDD Base 40° F

**Example:**

- Max Temp 85°F with Min Temp 68°F
  - $GDD = [(85.0 + 68.0) / 2] - 40$
  - $GDD = 36.5$

If night Min > 70°C or GDD > 35°C

=

Increased Stress on Potatoes



# Weather (CGDD)

Cumulative Growing Degree Days (CGDD) are a useful measurement of how much heat your crop experienced.

CGDD Base 5.0 or GDD (5.0)

**Example:**

- Max Temp 29.4° C with Min Temp 20 ° C
  - $GDD = [(29.00 + 20.00) / 2] - 5$
  - GDD = 19.5

If night Min > 21°C or GDD > 20°C

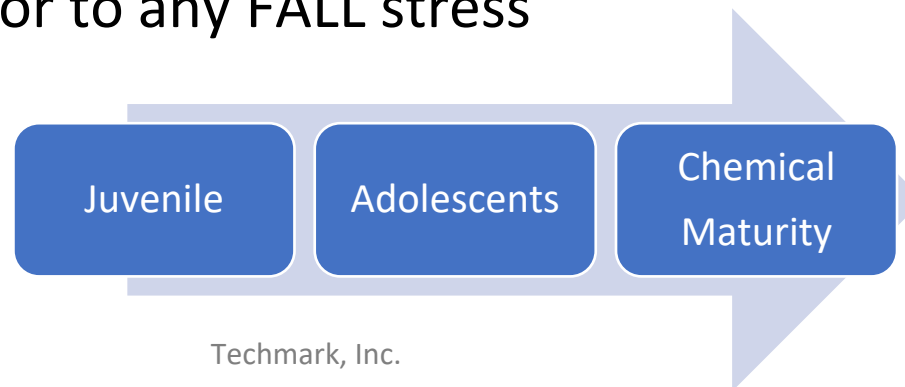
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Increased Stress on Potatoes



# Defining the Crop Maturity: Pre-Harvest Sugars and Potato Maturity

- A key item you need to know and understand for a successful storage season.
- Tuber Sucrose Rating along with canopy vigor is used to determine where a crop is in its tuber life cycle
- Immature (High N or Low CGDD)
  - N impacts maturity, unused N pushes maturity
- Issues compounded when other stress factors added into the equation (Drought/Disease).
- Maturity Evaluated prior to any FALL stress





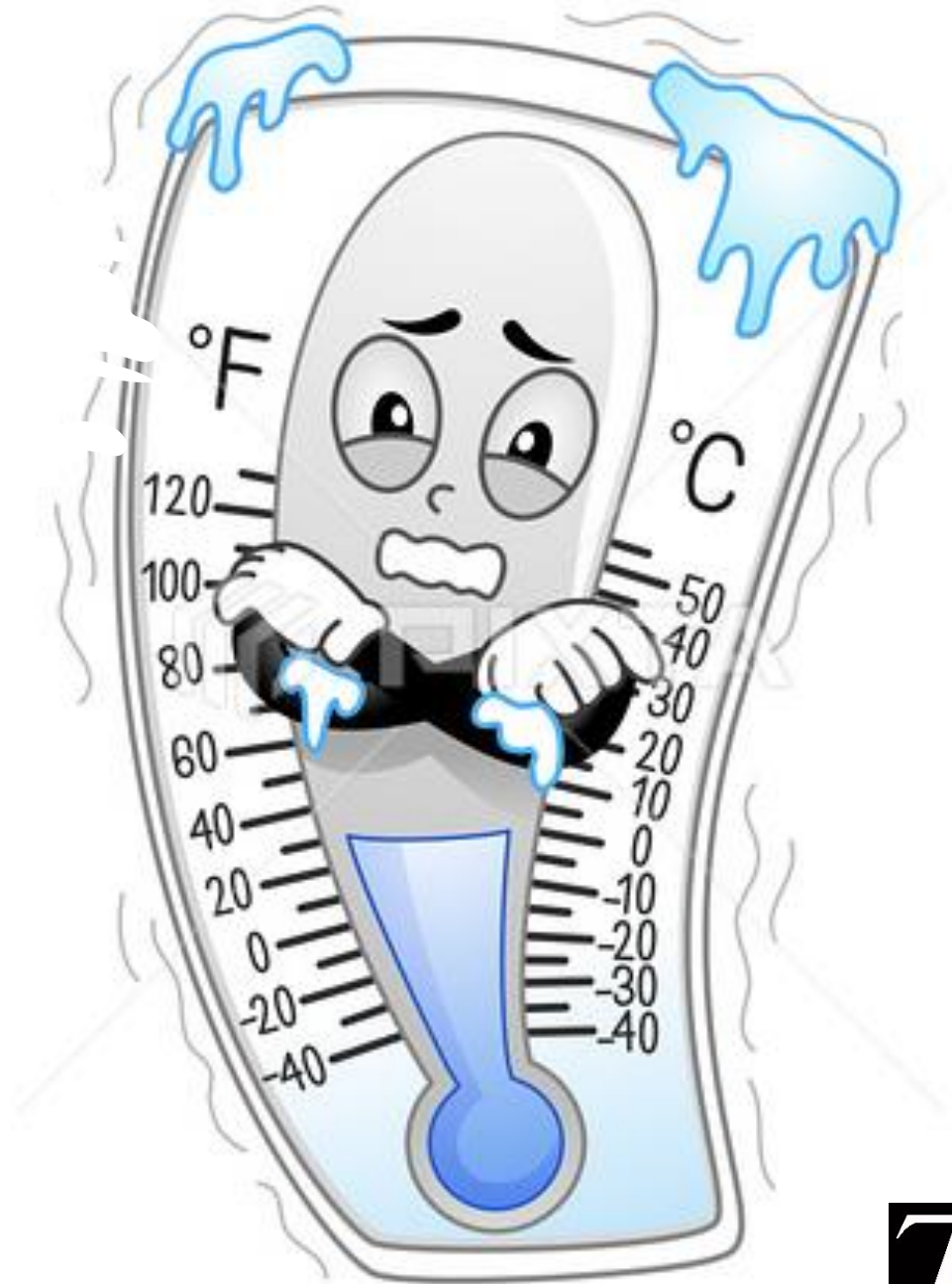
# Pre-Harvest Sample cost vs Nitrogen (N) application

- Nitrogen production – Urea \$673.00/ ton.
- Assuming that a potato crop needs 200 lbs of N/acre or \$152.95/acre
- $\$152.95 \times 80 \text{ acre} = \$12,236.00$  for Nitrogen on 80 acres.
- \$200/ 2 pre-harvest samples to evaluate the impact of Nitrogen on maturity.
- \$400 cost of pre-harvest sampling total for a field.
- Pre-harvest sampling cost for 80-acre field is \$5.00 per acre
- Growing season Report Card on Maturity.



# Pre-Harvest Sucrose Analysis Prior to Fall Frost

- Critical to assess maturity prior to Fall Stress – Cold Harvest Temperatures
  - Immature Potatoes that experience Frost in the Field Require Pre-Conditioning Above 52 F to Remove Excess Sugars in Storage.
  - Mature Potatoes that experience Frost in the Field Can be Stored at 50 F and Chip Quality will Improve over time.



# Defining the Crop: Current Practice

- Pre-Harvest Sugar Sample Collection
  - Field Variability, where do I measure?
  - What are Canopy Rating and Uniformity?
  - What the barriers to getting this information?





# Pre-Harvest Sample Recommendation

- 2 samples are recommended for pre-harvest testing. 3 weeks and 1 week before vine kill.
- 40 Tubers are required per-sample.
- Techmark lab will analyze sugars (Glucose & Sucrose), yields, and specific gravity.
- Techmark provides a sample pickup/dig service.

Techmark Pre-Harvest Panels XXXXXXXXXX  
 Field Name: MRC-CO11037-5W -- Variety: C011037-SW  
 Sample Date: 9/1/2021 Client Field Code:



**FIELD DATA-- CGDD**

Canopy Rating	Canopy Uniformity	Number of Hills	Number of Stems	Sample_ID
				6

**TUBER COUNTS and WEIGHTS**

Chip Potato	< 2 inch	< 3 inch	< 4 inch	≥ 4 inch	Unsize	TOTAL
Count					42	42
Weight (lbs)					6.543	6.543
Weight (kg)					2.968	2.968

**LAB DATA**

Pulp Temp.1 (F)	Pulp Temp.2 (F)	Pulp Temp.3 (F)	Count	Air Weight (g)	Water Weight (g)	Water Temp. (F)	Presence of Hollow Heart
67.5	68.0	67.6	30			72.7	no
Average Pulp Temp.			Specific Gravity Adjustment		Specific Gravity		Frito Lay Solids
67.7					1.089		18.38

Raw Glucose (g/L)	Raw Sucrose (g/L)	Glucose %	Sucrose (%x10)	GDD Plant to Panel
13	198	0.003	0.426	

Notes:



# Defining the Crop Disease:

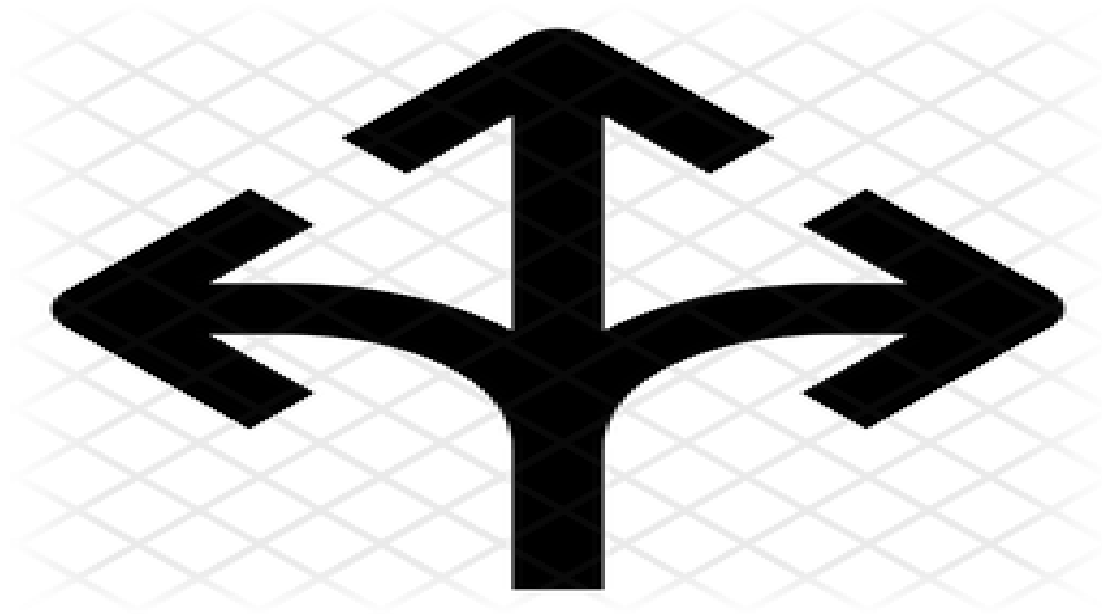
Have your fields experienced disease pressure?



- What type of disease pressure?
- Observations of impact to crop quality?
- What does our historical knowledge of this disease tell us about challenges we may experience during storage?



# Potato Storage Sugar Discussion



# Storage Sample Procedure

- Every 2 weeks throughout the storage season
- Every week as potatoes near senescence (or as sugars dictate)
- Select a representative location in the bin. If multiple fields are present, sample from multiple locations in bin to represent each field.
- Remove top layer of tubers (20 cm), place 40 tubers in sample container. Mark location for future sampling.



# Storage Management: End Pre-Conditioning and Begin Cooling

- Factors That Determine When to Cool Potatoes:
  - Cool Pathogen Challenged Rotting Potatoes to 48 F Quickly
  - Pre-Harvest Sugar Information
    - Immature (Longer Pre-Conditioning)
    - Mature (No Pre-Conditioning)
    - Field Frost and Immature (Longer Pre-Conditioning and Early Market)
  - In Storage Sugar Sampling
    - Sucrose Rating Below 1.0
    - Percent Glucose Below 0.15
    - Acceptable Process Quality





# Storage Management: Cooling

- Determine Holding Temperature in Conjunction with Field Staff/Agronomist
  - Storage Duration
  - Potato Condition
  - Market (Chip/Table/Seed)
- **Cooling Rate**
  - .4 Deg/Day to 50 for French Fries/Chip
  - .4 Deg/Day to 45 for Seed /Table
  - .2 Deg/Day to Final Temp for French Fries/Chip



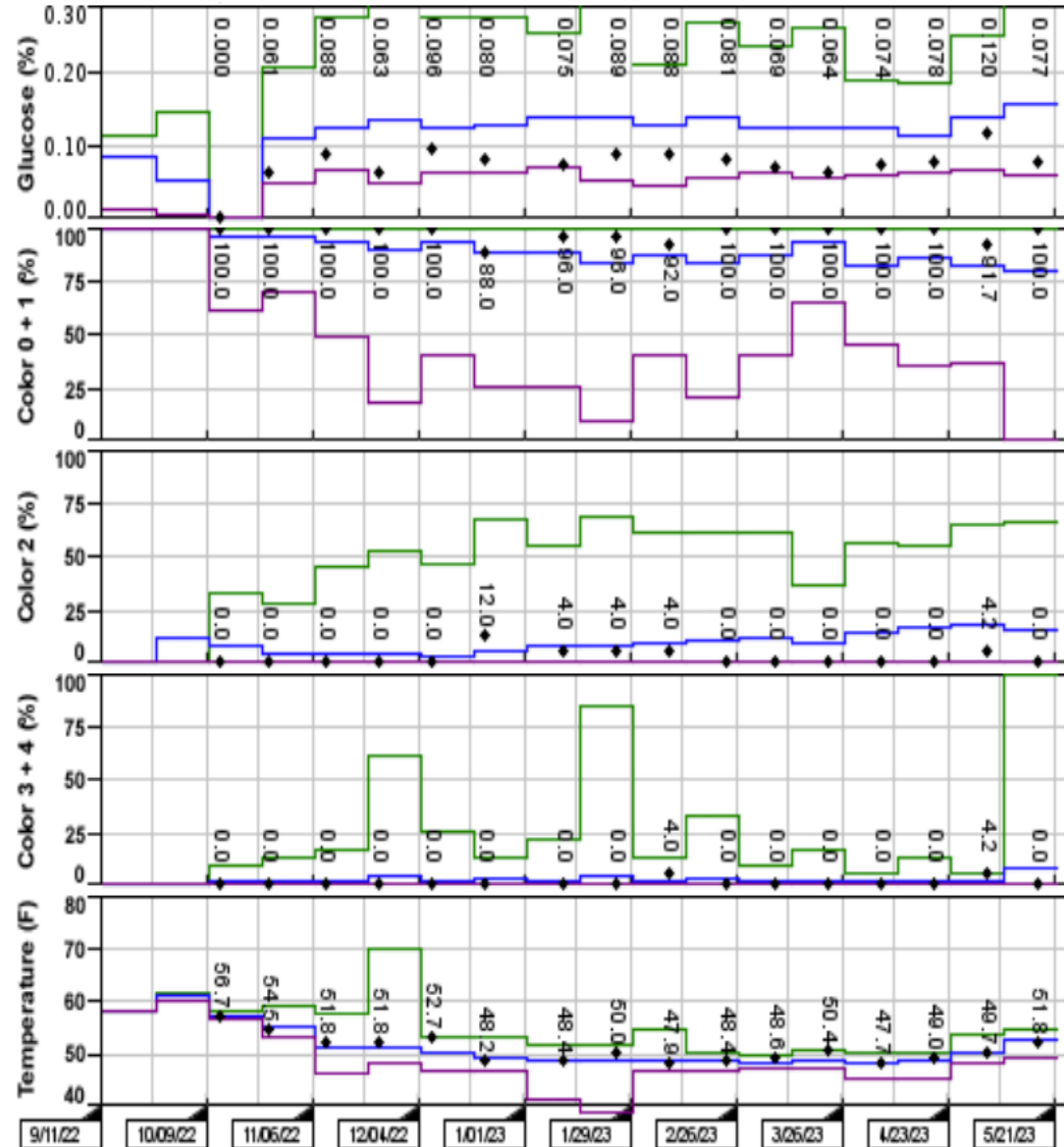
# Storage Management: Cooling

- Equipment Operations:
  - Fan – Max Speed
  - Humidity – 98-100%
  - Heat – OFF
  - Maximum Diff Pile/Plen
    - 3.0 degrees Cooling
    - 2.0 degrees Holding



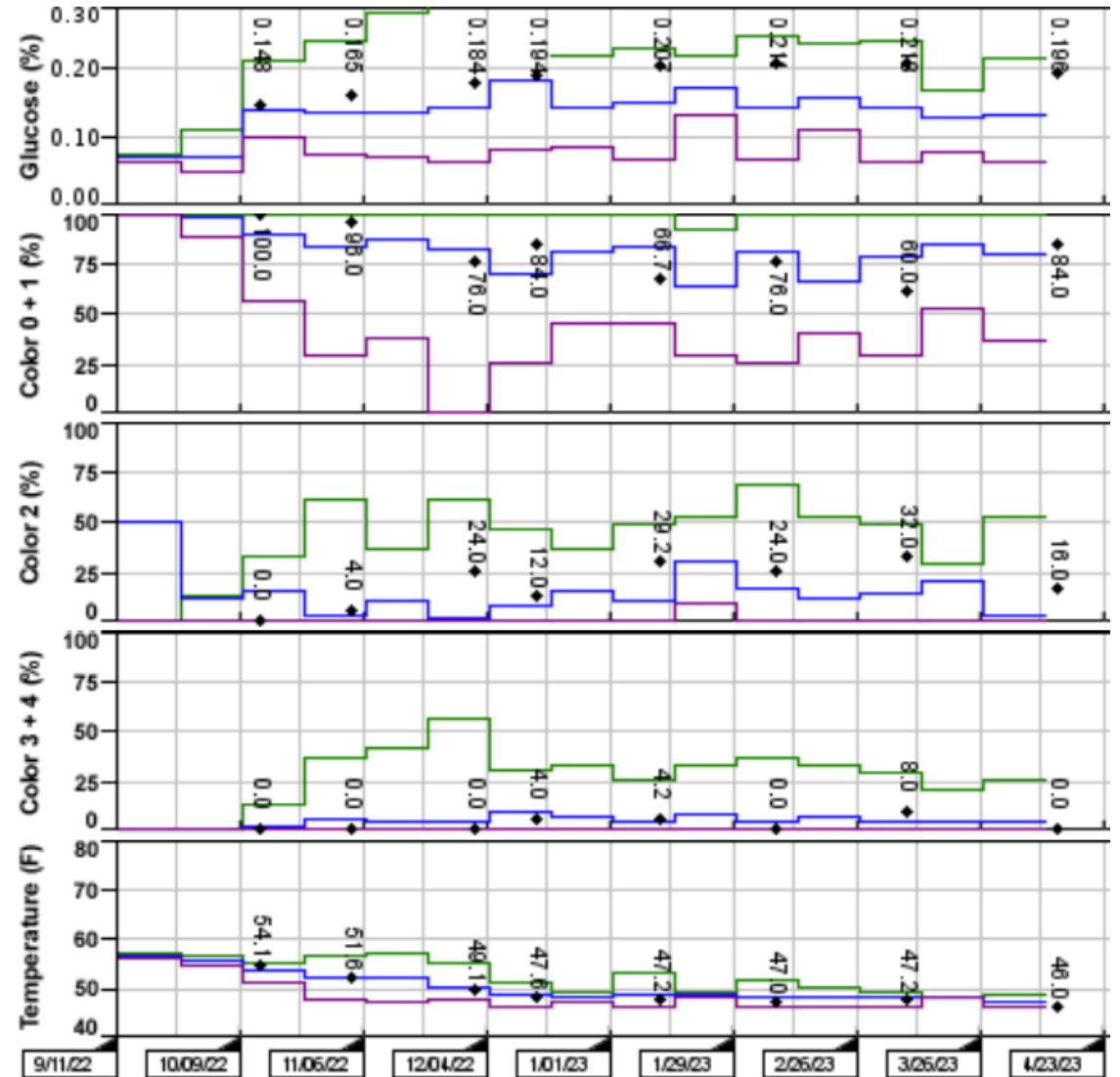
# Storage Management: Holding

- Proper Holding Temperature
  - Stable to Falling Sucrose
  - Stable to Falling Glucose
  - Quality Improvement After Cooling



# Storage Management: Holding

- Holding Temperature to Low
  - Rising Sucrose
  - Rising Glucose
  - Quality Degrading



**“The Potato Will Never Let  
Us Know All the Secrets”**

**The Late Dr. Burt Cargill, 1985**







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