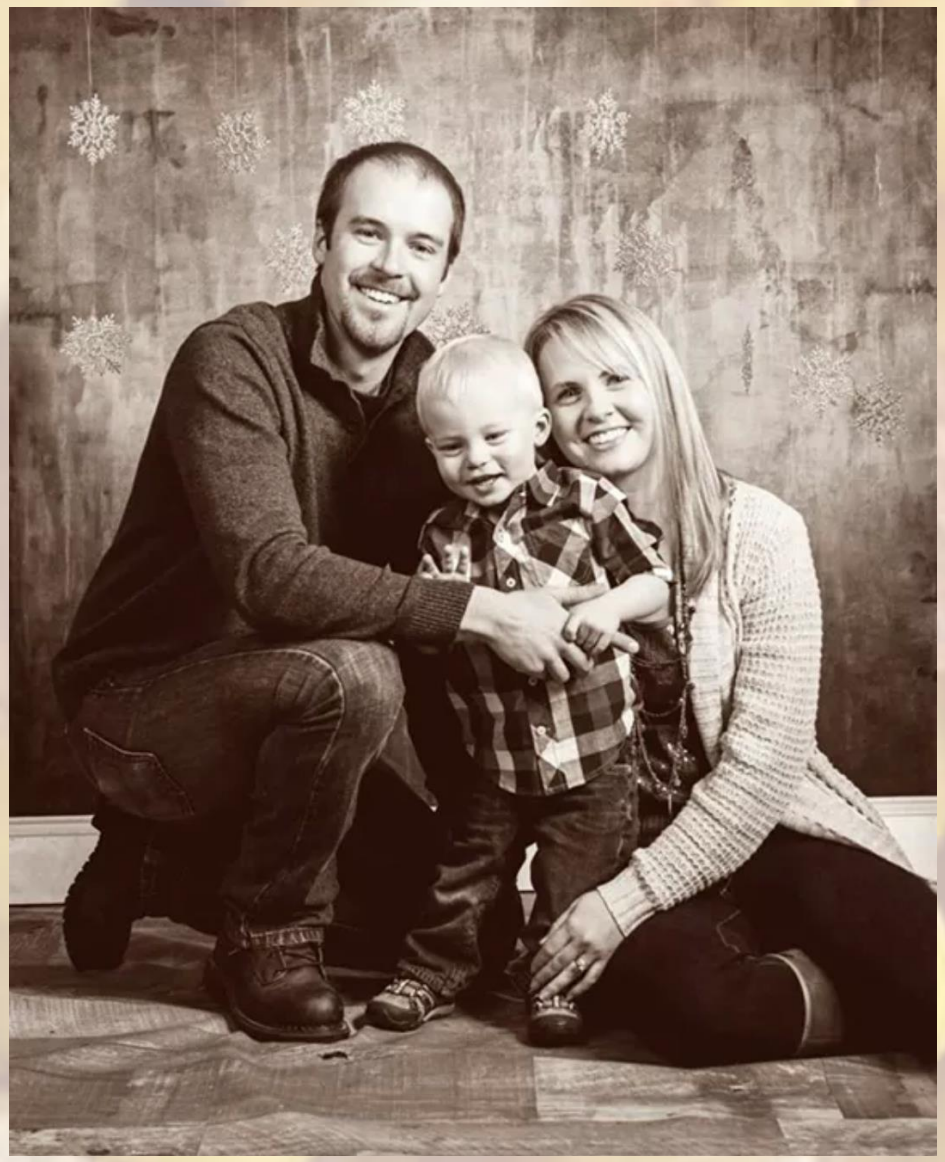
Corn kernel weight during post-black layer drydown

Aaron Prestemon

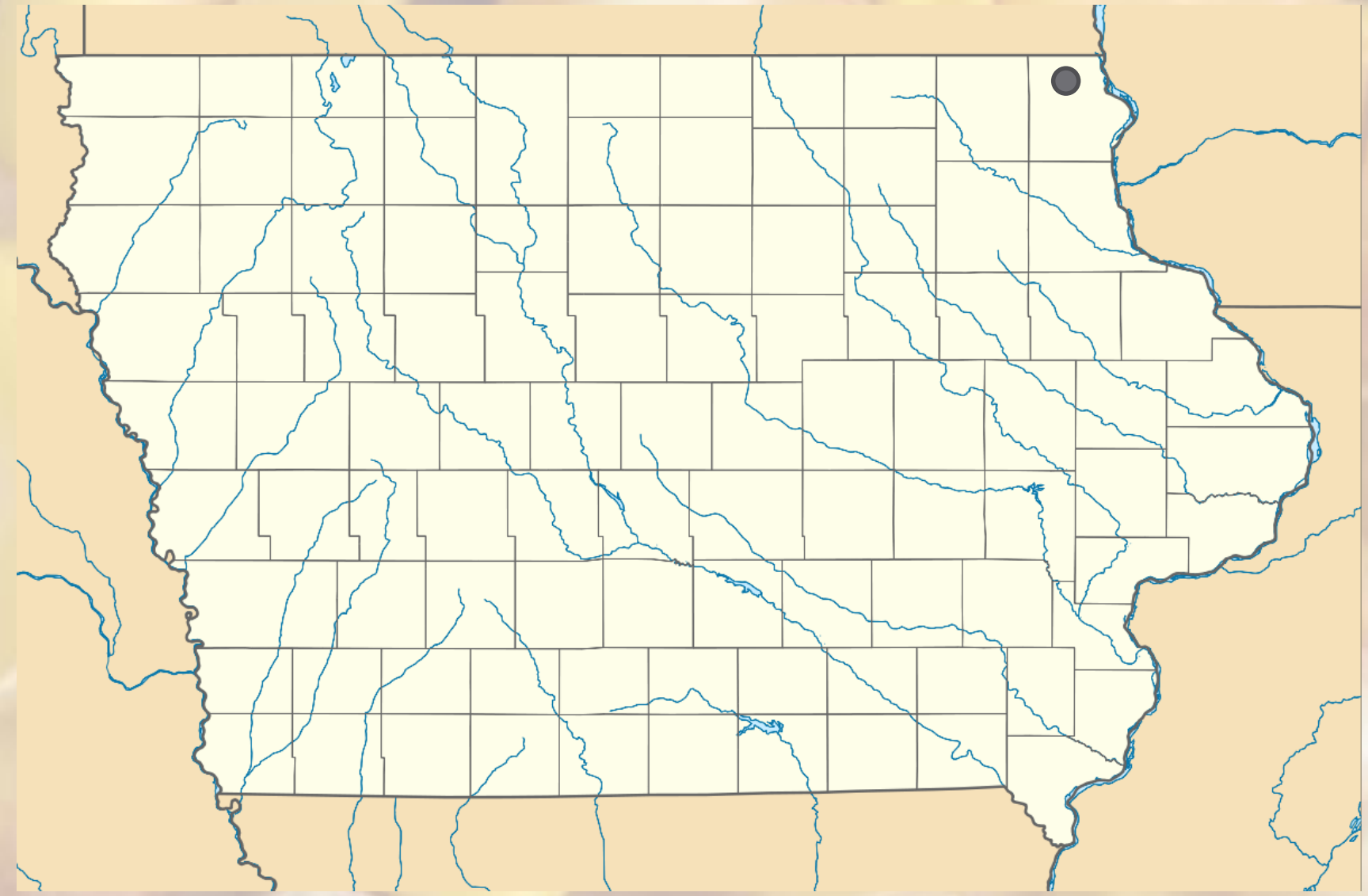
Overview

- Personal Background
- Introduction
- Objective
- Materials and Methods
- Results and Discussion
- Recommendation
- Questions

Family-Sarah, Hoyt, & Rocky



Background- Dorchester, IA



Career-Work Experience

- B.S. Agricultural Business, Iowa State 2008

- DuPont Pioneer
  - Sales Trainee (Summer 2008) Mankato, MN
  - Account Manager (2008-2011) Fond du Lac, WI
  - Field Agronomist (2011-Present) Fond du Lac, WI & Dorchester, IA

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Introduction

- Popular farm magazines and internet forums have questioned if potential field corn yield losses are due in part to reduction in kernel dry matter

- Research has suggested dry matter can decrease as much as 1% for every 1% loss in grain moisture after R6 (Finck. 1995)

Photo: John Deere

Introduction (cont.)

- Typical range of corn grain moisture at harvest will be 15-30% in Wisconsin
- Profits and losses in farming are determined, in part, by harvested yield
- If dry matter losses are confirmed, harvesting at high moisture might be economical

Introduction (cont.)

- Seed respiration has been cited as possible cause for any dry matter loss after R6 (Finck 1995)

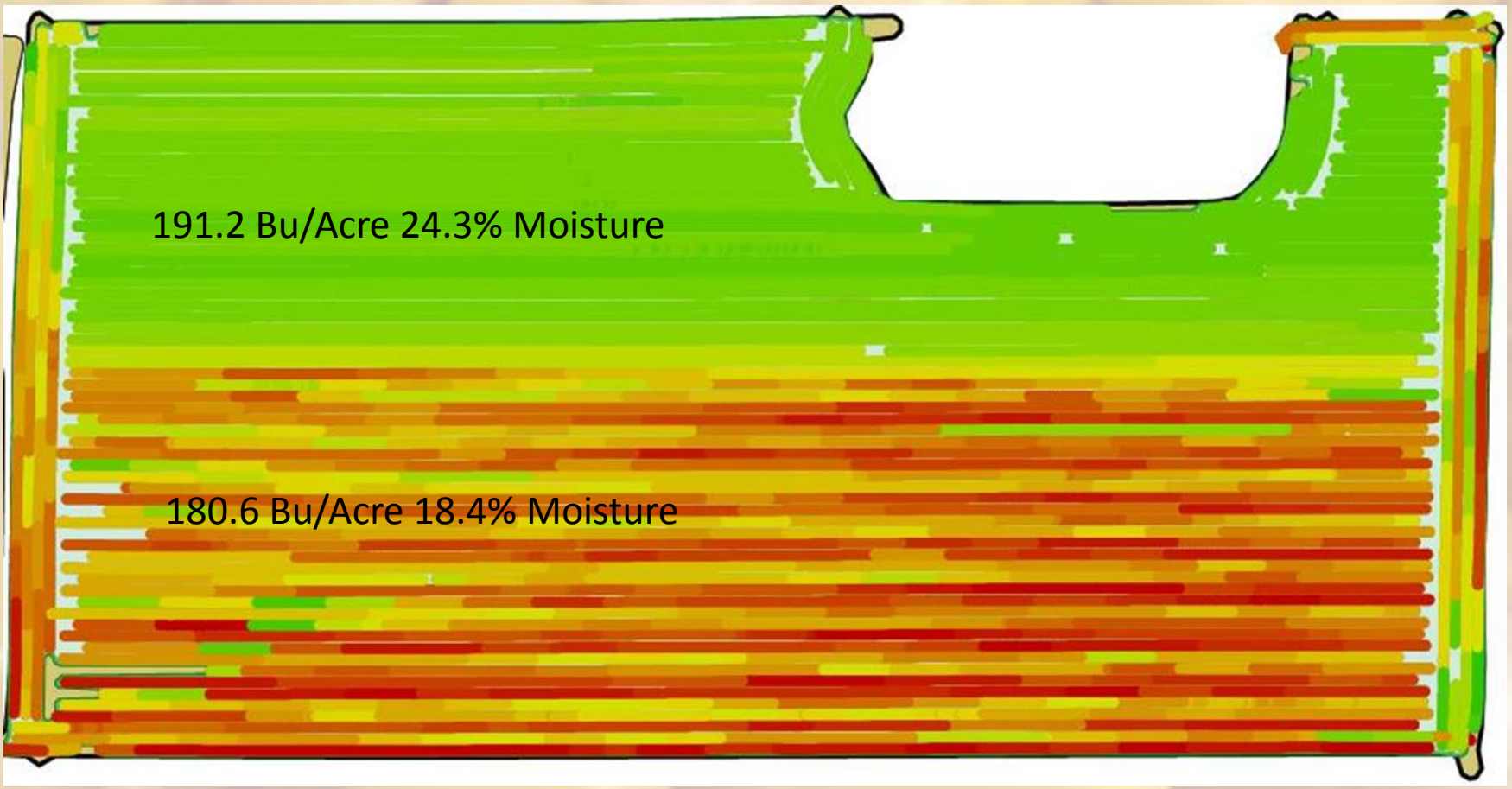
- More recent data from 3 year study advocates any loss in yield would likely be derived from mechanical loss. (Elmore, Roeth 1995-1997)
  - This suggests no loss of dry matter during grain drying process in field

Introduction (cont.)

Examples of decisions that could be based on minimizing dry matter loss are:

- Hybrid Maturity
- Planting Date
- Harvest Schedule

Motivation for this Creative Component



Objective

Evaluate changes in kernel dry matter and grain moisture level over time to provide farmers with information to use in harvest decisions

Materials and Methods- Experiment Design and Treatments

- Randomized Complete Block Design
- 5 Treatment Dates of kernel sampling
  - Oct. 3, 10, 17, 24, & 31
- 4 Locations with differing soil characteristics and growing environments
- (ANOVA) for the comparison of means and protected Fisher least significant difference test at .05 levels for statistical differences in the means.

Materials and Methods- Agronomic Practices

- Each Grower utilized a 8 row 30” corn planter
- Seeding rate of 35,000 seeds per acre
- Nitrogen and weed control

following grower practices

Materials and Methods-Kernel Sampling Procedure

- 3 consecutive ears starting from protocol in table below
- 40 Hand shelled kernels from center portion of each ear were used for all samples

Date	Sampled Row	Sampled Area
3-Oct	Row 2	3 paces in from South Alley
10-Oct	Row 7	3 paces in from South Alley
17-Oct	Row 2	5 Paces in from South Alley
24-Oct	Row 7	5 Paces in from South Alley
31-Oct	Row 2	8 Paces in from South Alley

Kernel Sampling Procedure (cont.)

- Sample kernels were shelled and put into dryer on afternoon of each sample date
- Ears were placed in paper bags for transport and then stored in cooler to minimize temperature variances

Materials and Methods- Kernel Drying Procedure

- Kernel replications were dried at 90 degrees Celsius for 72 hours

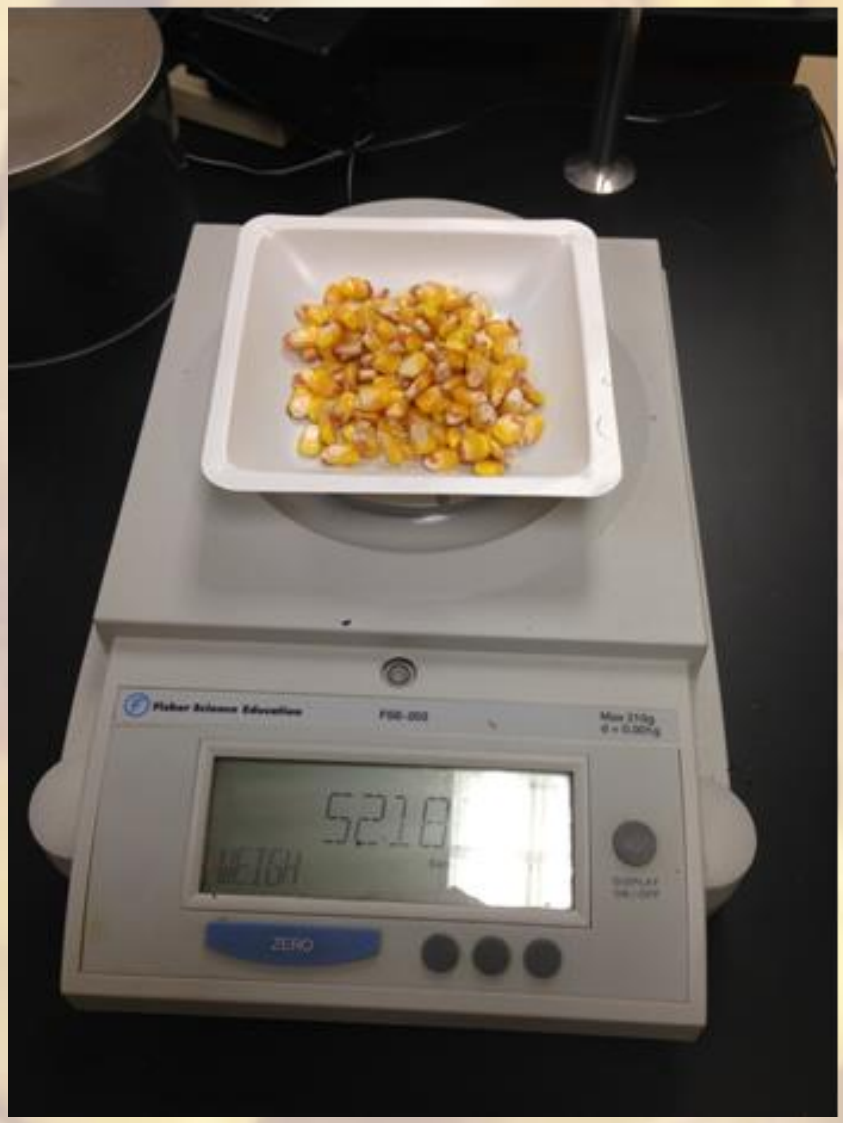
- Dry Weight and moisture were determined by:

  ((wet weight – dry weight) / wet weight) * 100

Kernel Drying (cont.)

- Open grid was utilized to ensure kernels dried uniformly
- No cross-contamination of samples occurred

Kernel Weighing



Materials and Methods- Selected Cultivar

<u>DuPont Pioneer P9917AMX</u>

- Selected because of wide geographic region it is sold
  - Wisconsin, Iowa, Minnesota, North & South Dakota
- Represents a very common maturity utilized for grain in central WI
- Very good seedling vigor and cold weather stress tolerance

P9917AMX

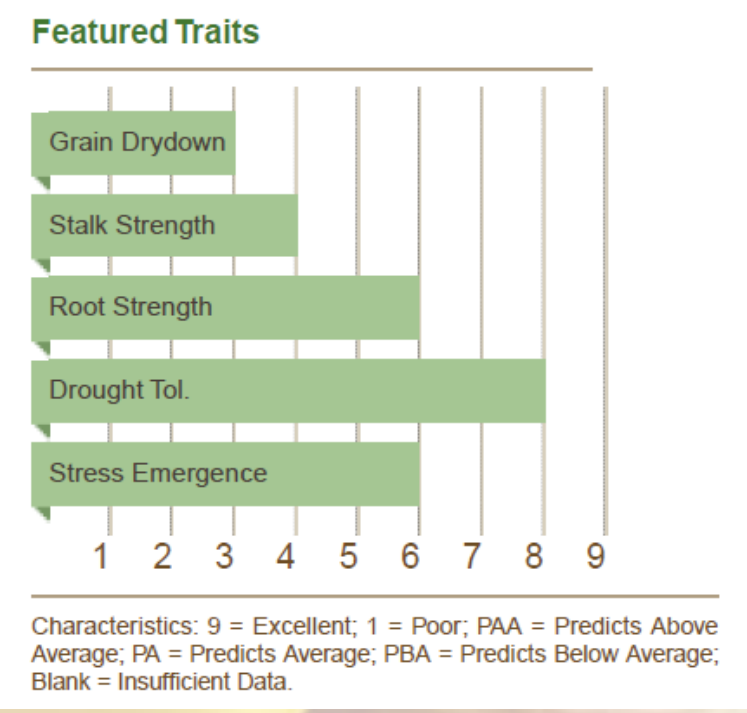
CRM	Silk CRM: 96 GDUs to Silk: 1200	Phy. CRM: 98 GDUs to Phy. Mat.: 2350
99		

Product Highlights:

- Moderate plant stature minimizes residue
- Early silk for maturity
- High drought tolerance allows variable soil placement
- Excellent grain quality

Management Suggestions:

•Early silk allows wide range of planting dates
•Good product to plant first because of great emergence



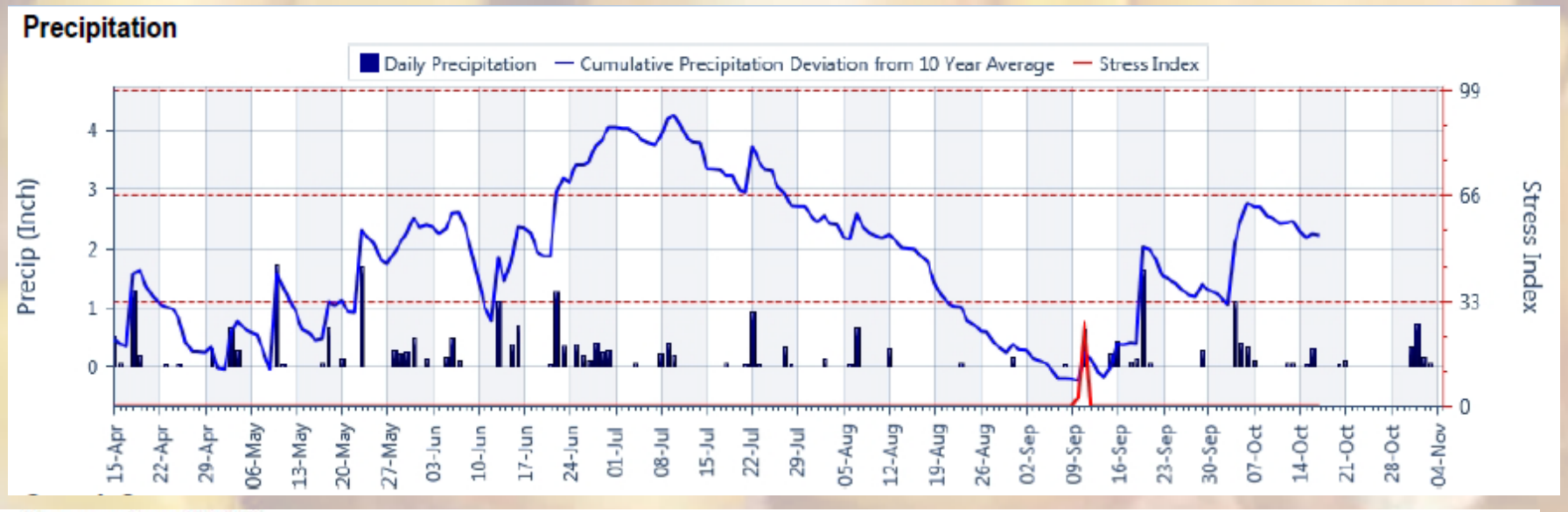
Locations

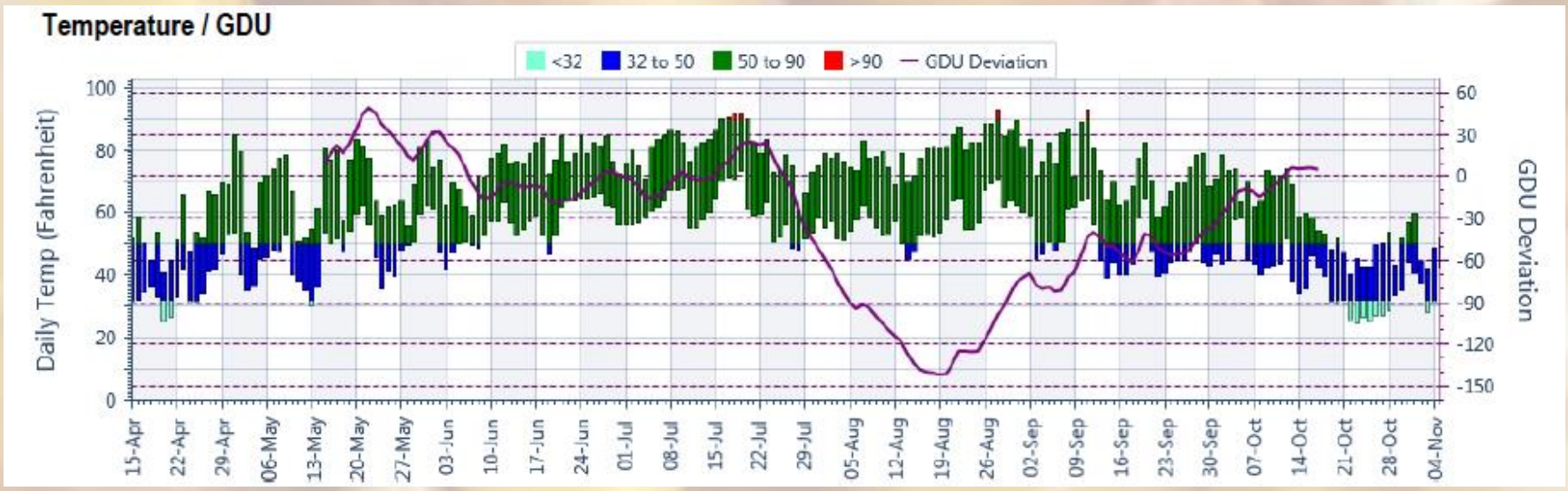

MICHIGAN
Douglas
Bayfield
Ashland
Iron
Vilas
Florence
Burnett
Washburn
Sawyer
Price
Oneida
Forest
Marinette
Polk
Barron
Rusk
Taylor
Lincoln
Langlade
Oconto
St Croix
Dunn
Chippewa
Menominee
Marathon
Shawano
Door
Pierce
Pepin
Eau Claire
Clark
Wood
Portage
Waupaca
Outagamie
Brown
Kewaunee
Buffalo
Trem-
pealeau
Jackson
Waushara
Winnebago
Manitowoc
Calumet
La Crosse
Monroe
Juneau
Adams
Marquette
Green
Lake
Fond du Lac
Sheboygan
Vemon
Richland
Sauk
Columbia
Dodge
Wash-
ington
Ozaukee
Crawford
Dane
Jefferson
Waukesha
Milwaukee
Grant
Iowa
Lafayette
Green
Rock
Walworth
Racine
Kenosha
IOWA
Lake

Site Description-Beaver Dam, WI

- Planting Date: May 15th
- Precipitation: 24.4” (+2.3” above 30 year avg.)
- GDUs: 2449 (+5.5 above 30 year avg.)
- Predominate soil type: Well drained St. Charles silt loam 0 to 2 % slope

Site Description-Beaver Dam, WI

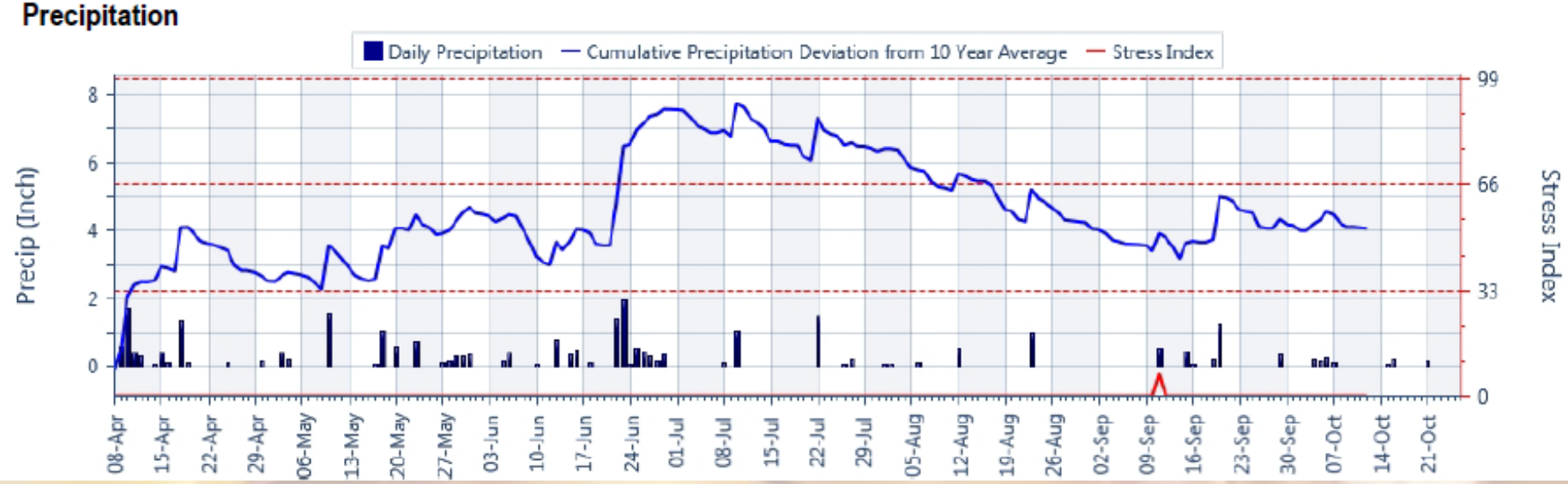


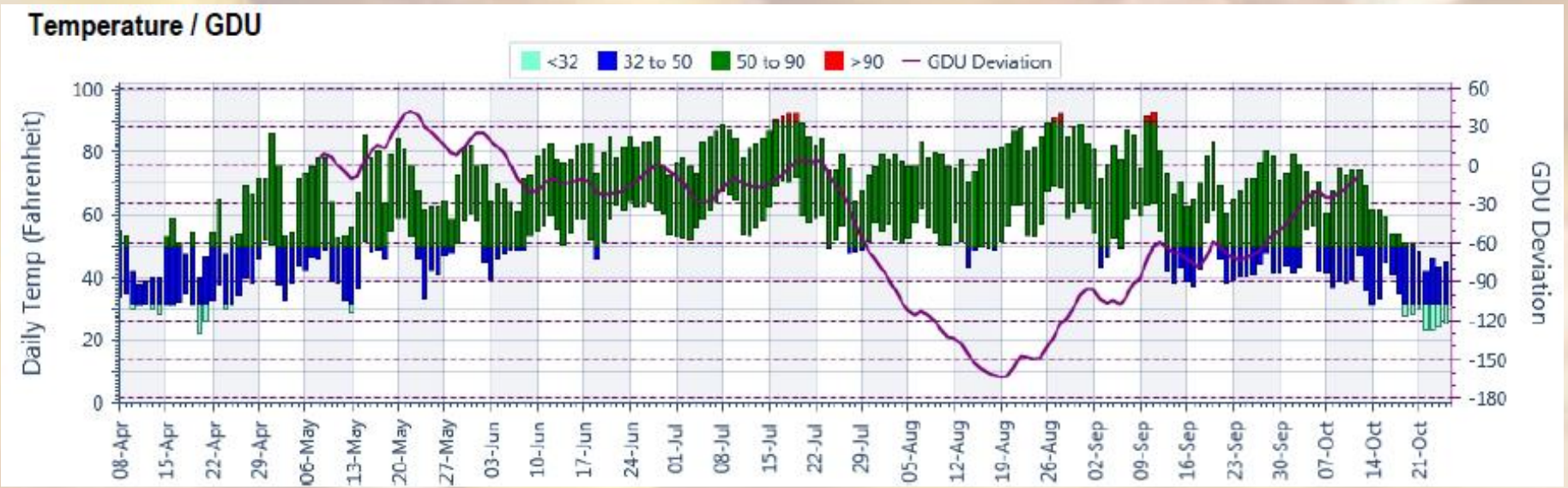


Site Description-Columbus, WI

- Planting Date: May 8th
- Precipitation: 27.2” (+4.1” above 30 year avg.)
- GDUs: 2497 (+7.2 above 30 year avg.)
- Predominate soil type: Well drained Plano silt loam 0 to 2 % slope

Site Description-Columbus, WI

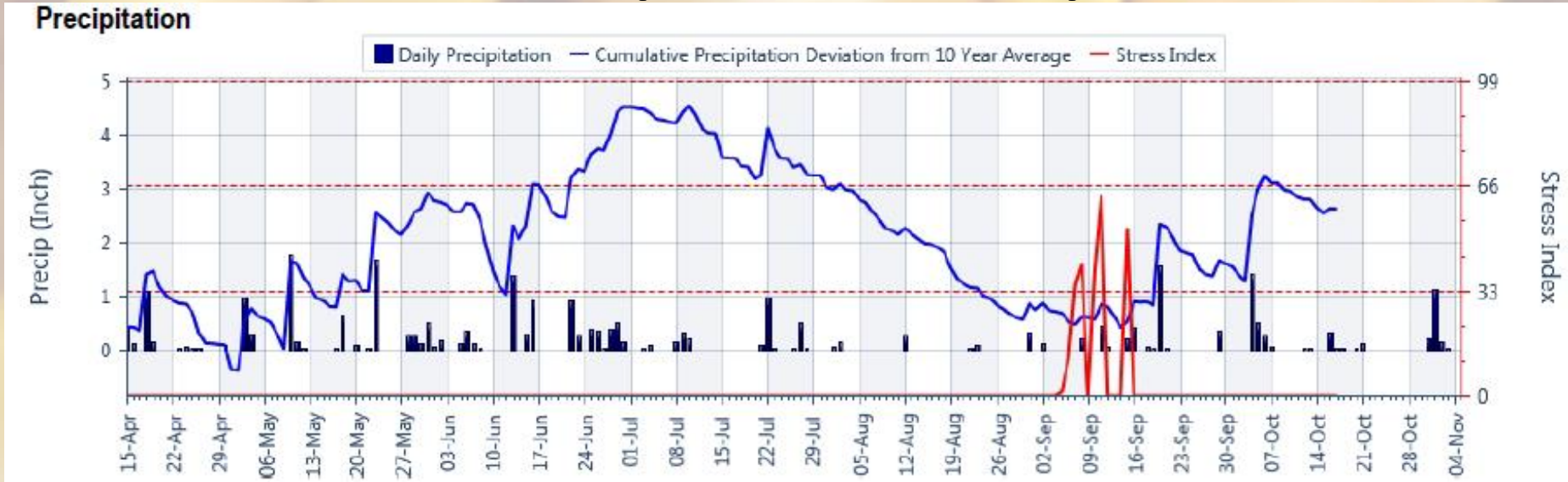


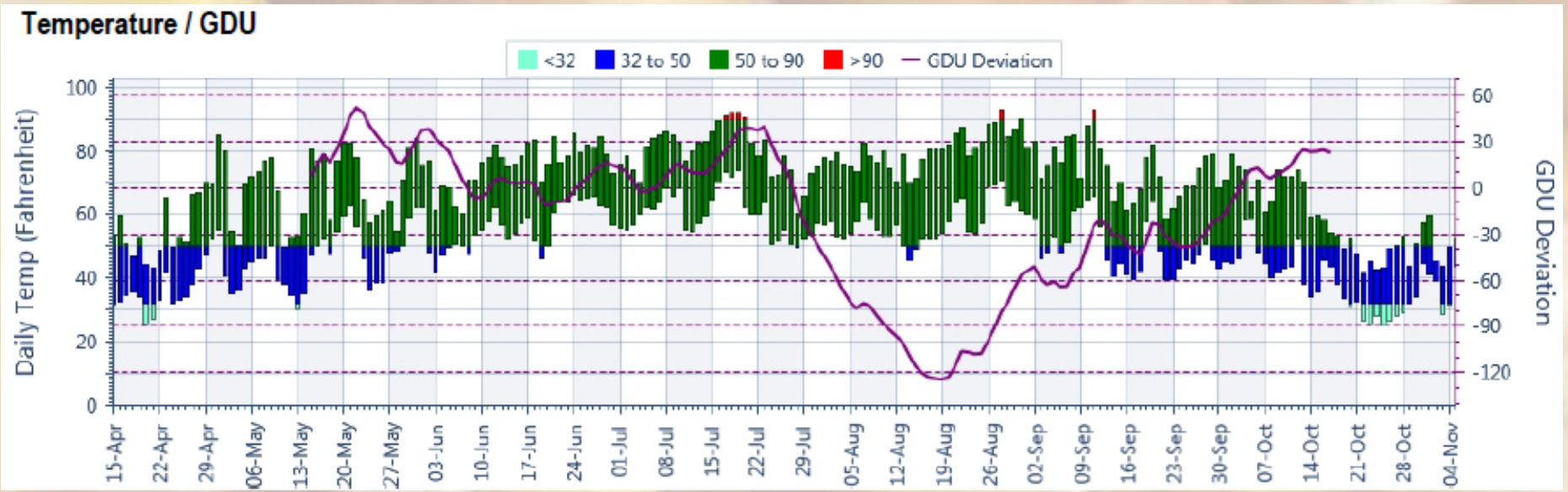


Site Description-Waupun, WI

- Planting Date: May 15th
- Precipitation: 24.1” (+2.6” above 30 year avg.)
- GDUs: 2449 (+5.5 above 30 year avg.)
- Predominate soil type: Eroded Lomira silt loam 2 to 6% slope

Site Description-Waupun, WI





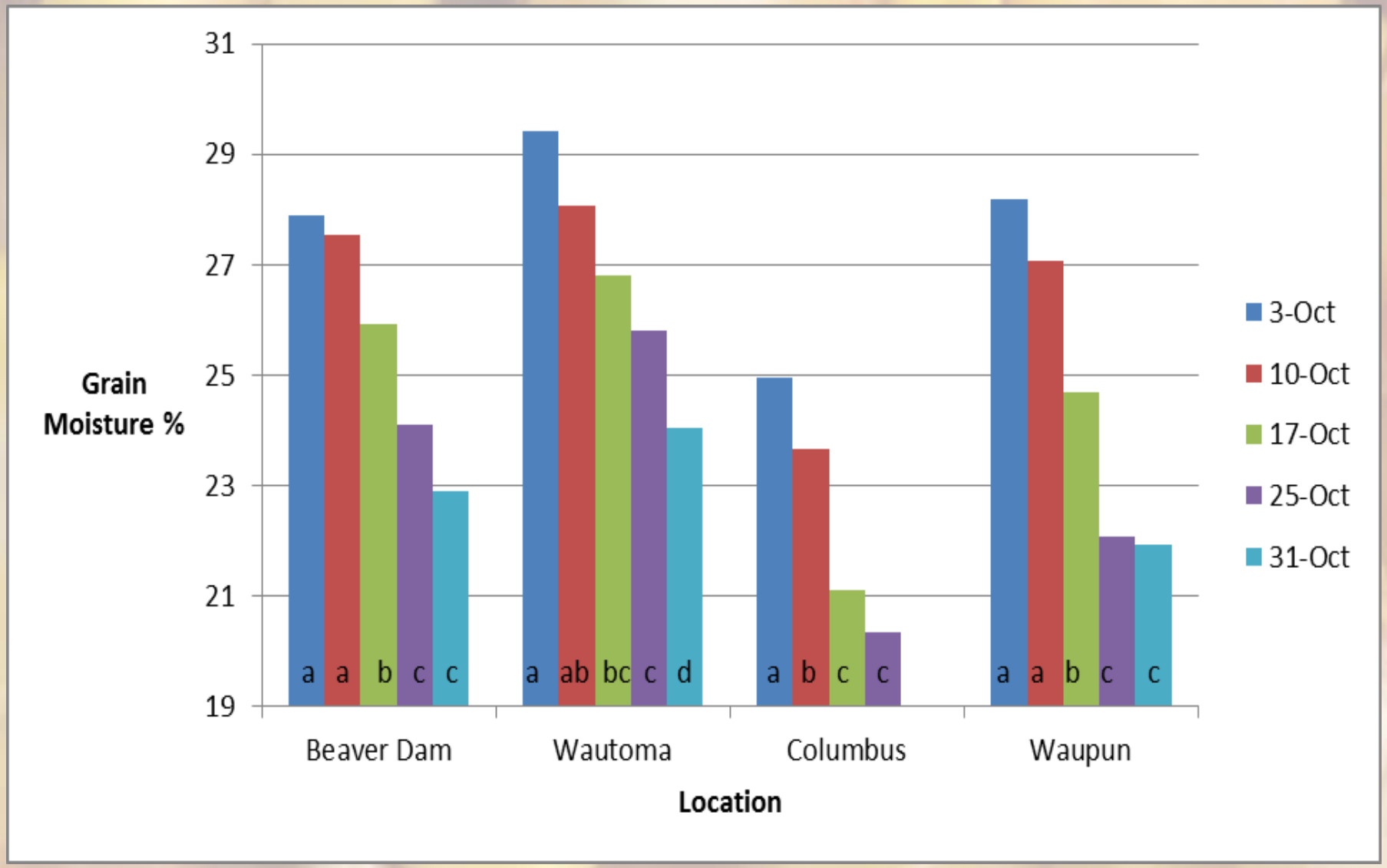
Site Description-Wautoma, WI

- Planting Date: May 6th
- Precipitation: Full irrigation
- GDUs: 2476 (+11.5 above 30 year avg.)
- Predominate soil type: Richford loamy sand 0 to 2%

Results and Discussion-Moisture

- There was a statistically significant drop in grain moisture for each location
- Total loss of grain moisture was 9.1% over the locations of the study
- Moisture loss rate differed in each location

Results and Discussion

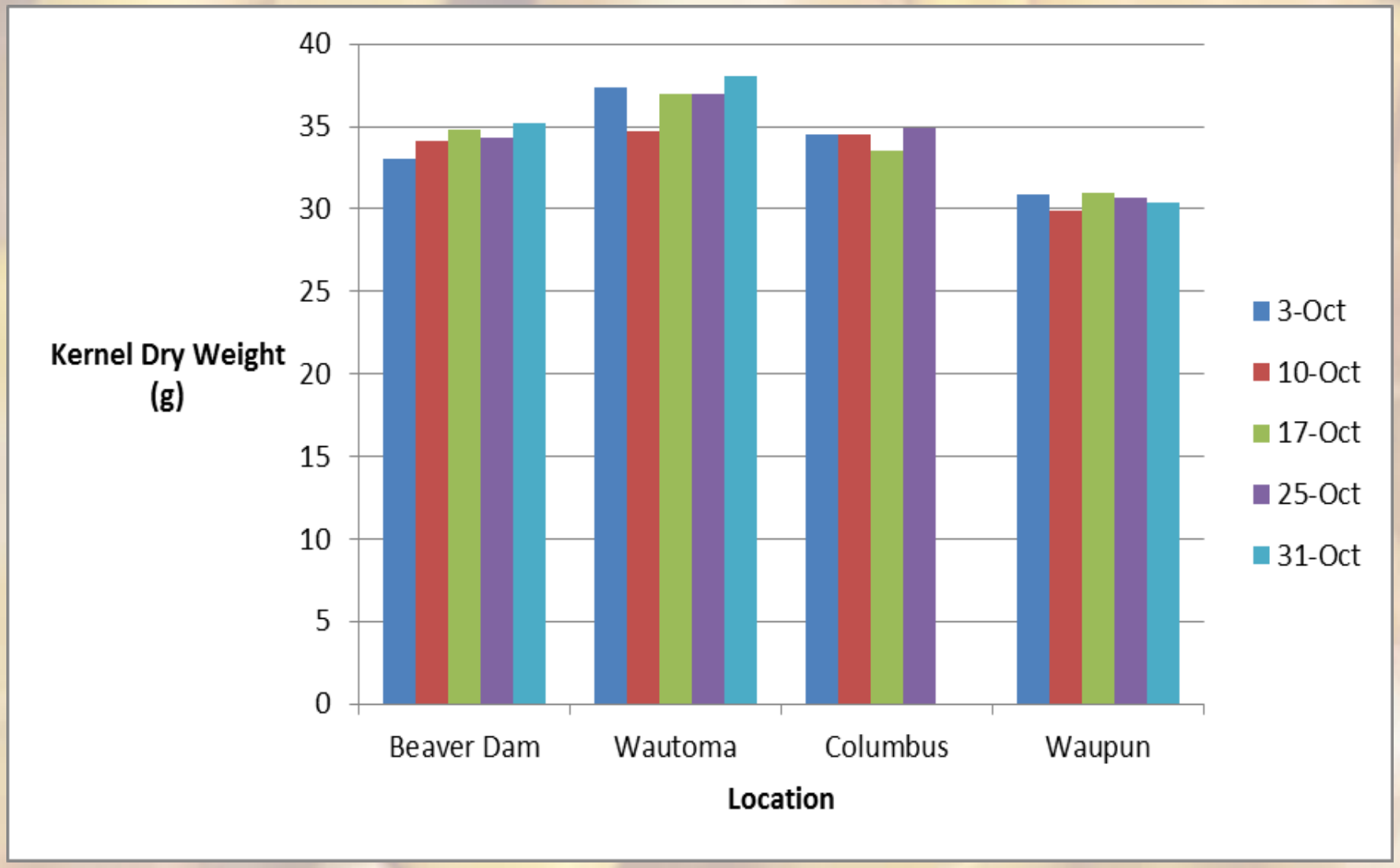


Means followed by same letter do not significantly differ (P=.05)

Results and Discussion- Dry Matter

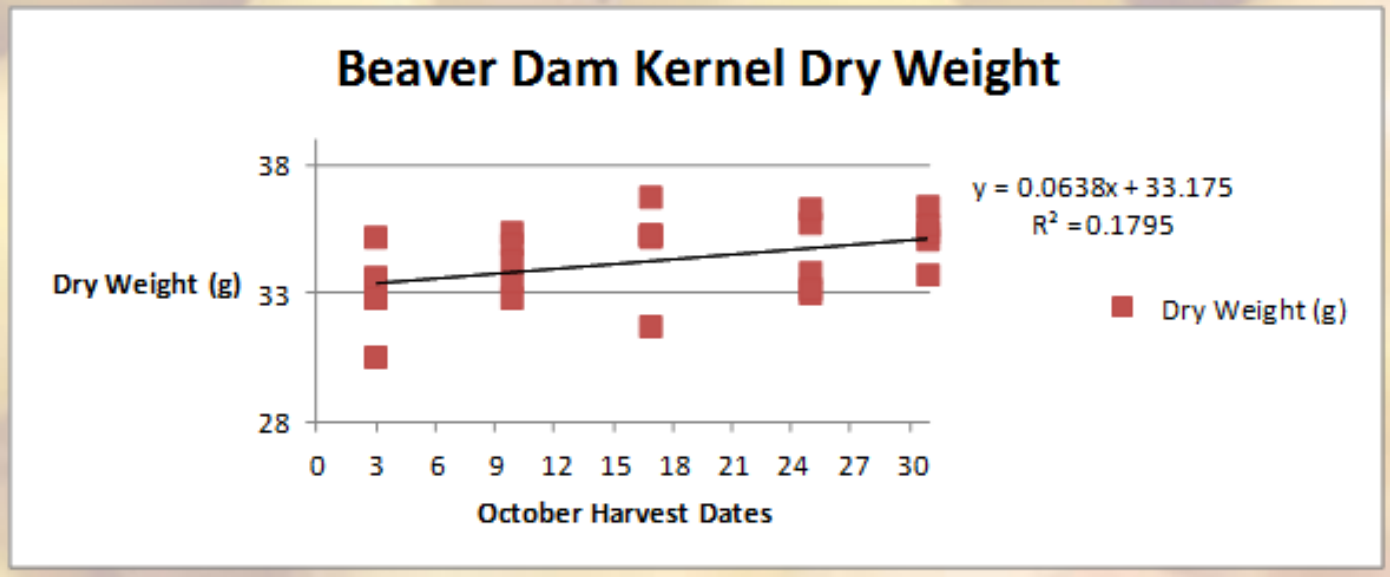
- Delayed harvest and grain moisture loss did not result in any statistically significant loss in dry matter
- Kernel sample for the study was consistent in the trial period
- Harvest date did not have a statistical effect on kernel dry weight in the study

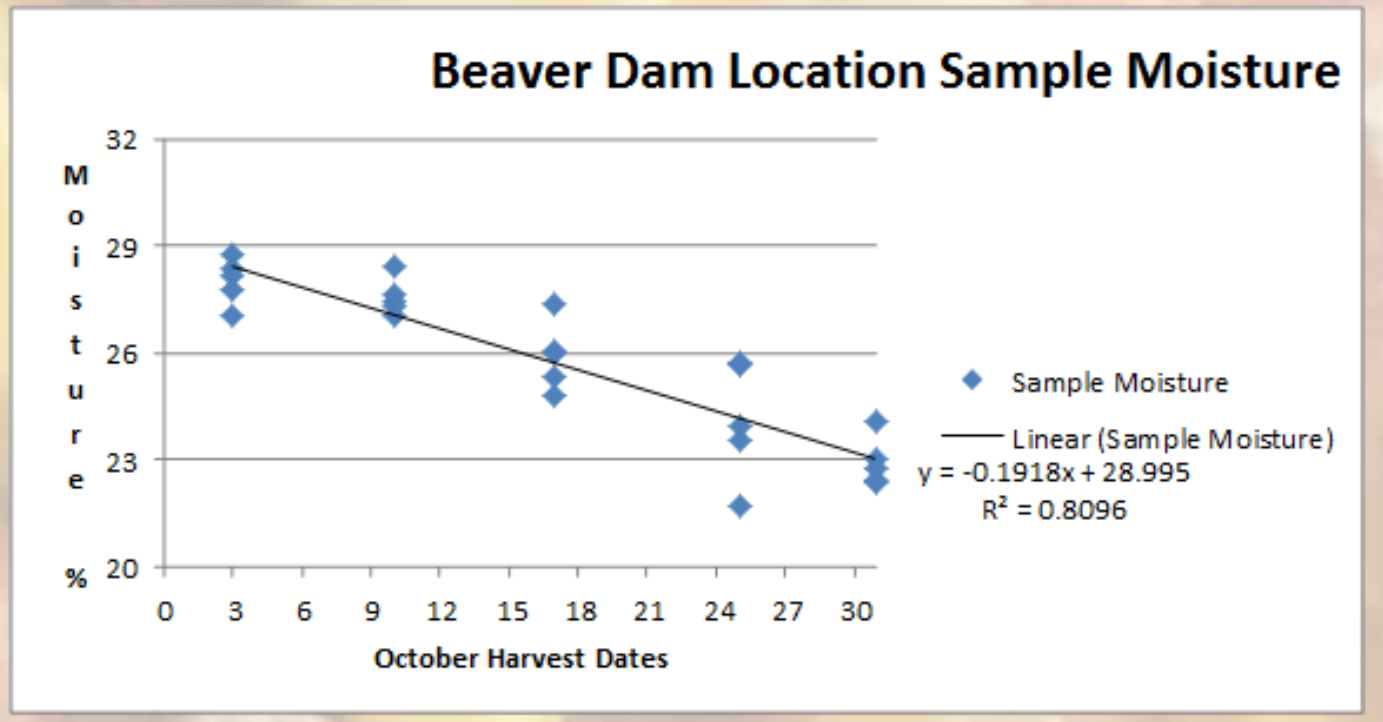
Results and Discussion

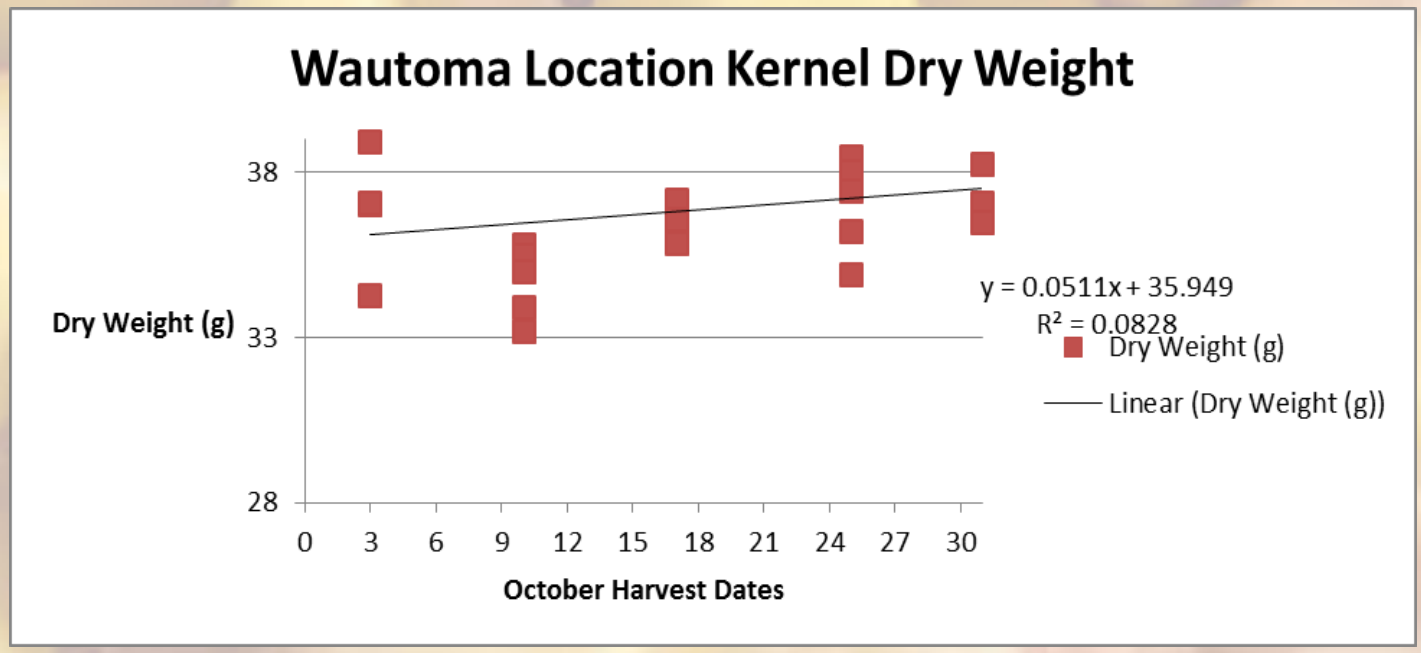


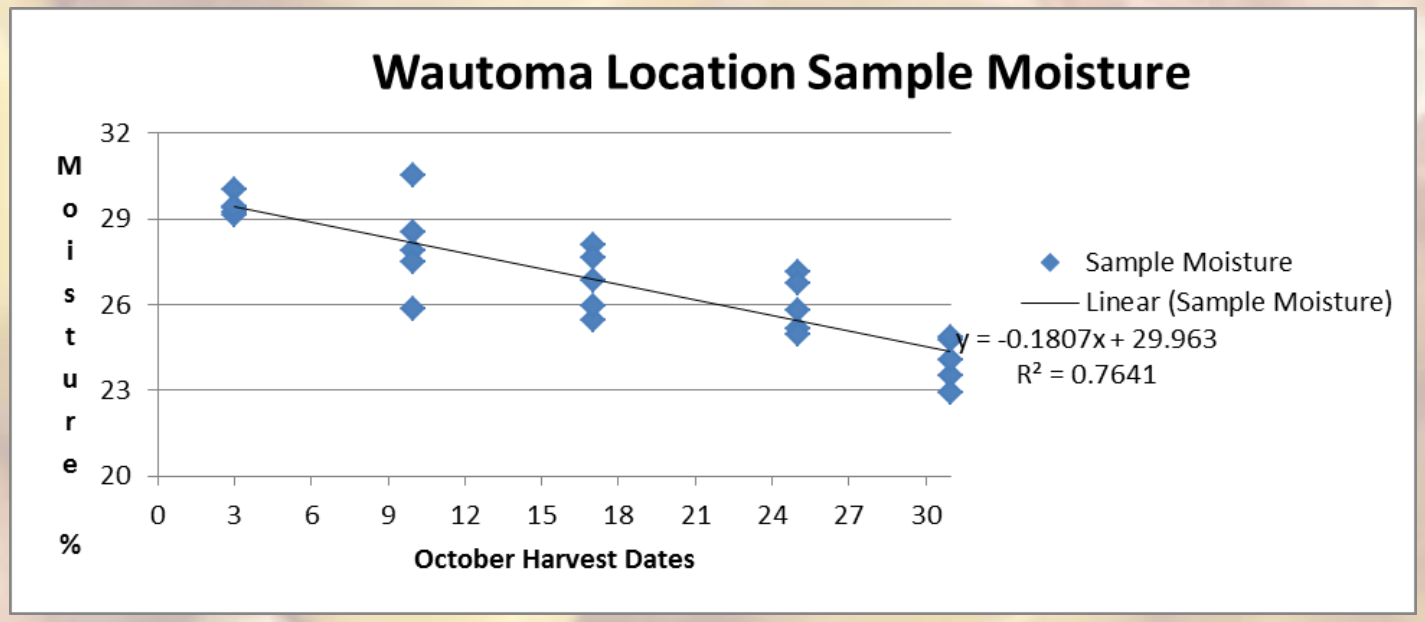
No statistically significant differences observed

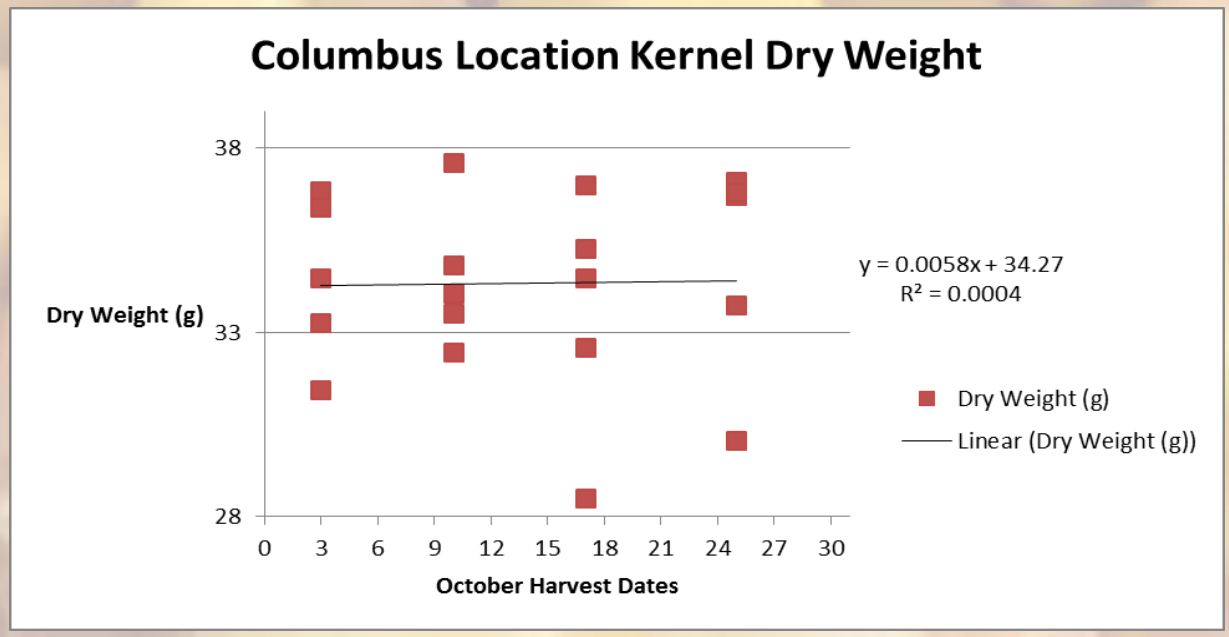
Detailed Results for Each Location

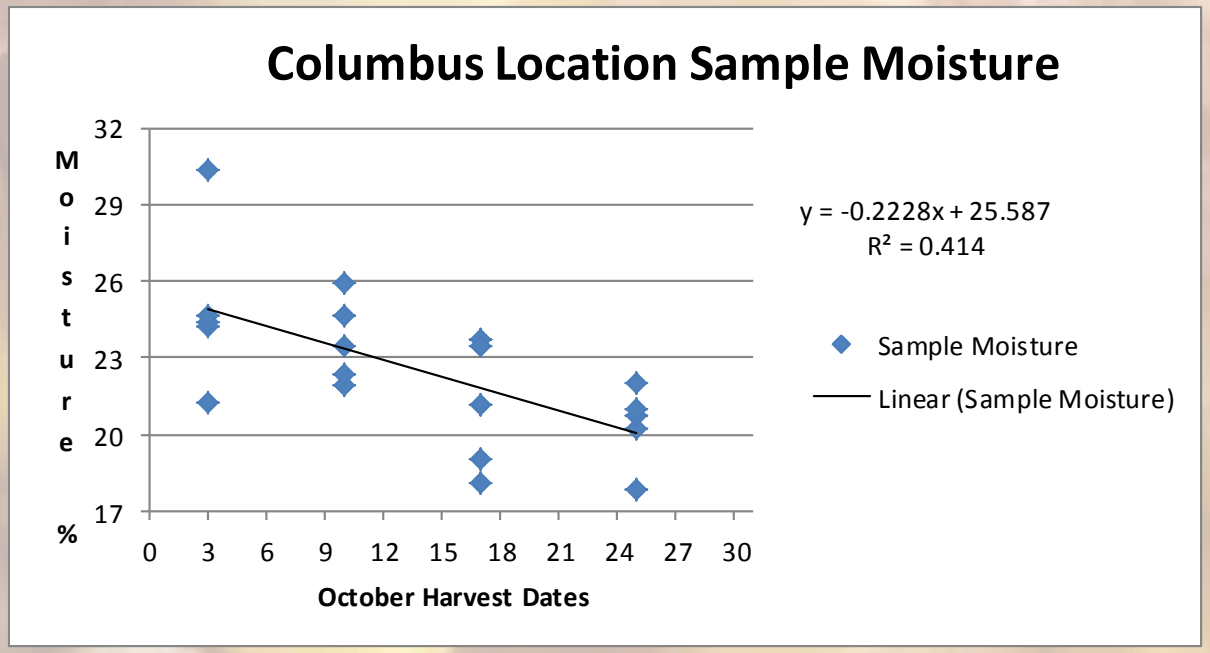

Beaver Dam Kernel Dry Weight
Dry Weight (g)
38
33
28
0
3
6
9
12
15
18
21
24
27
30
October Harvest Dates
y = 0.0638x + 33.175
R² = 0.1795
Dry Weight (g)

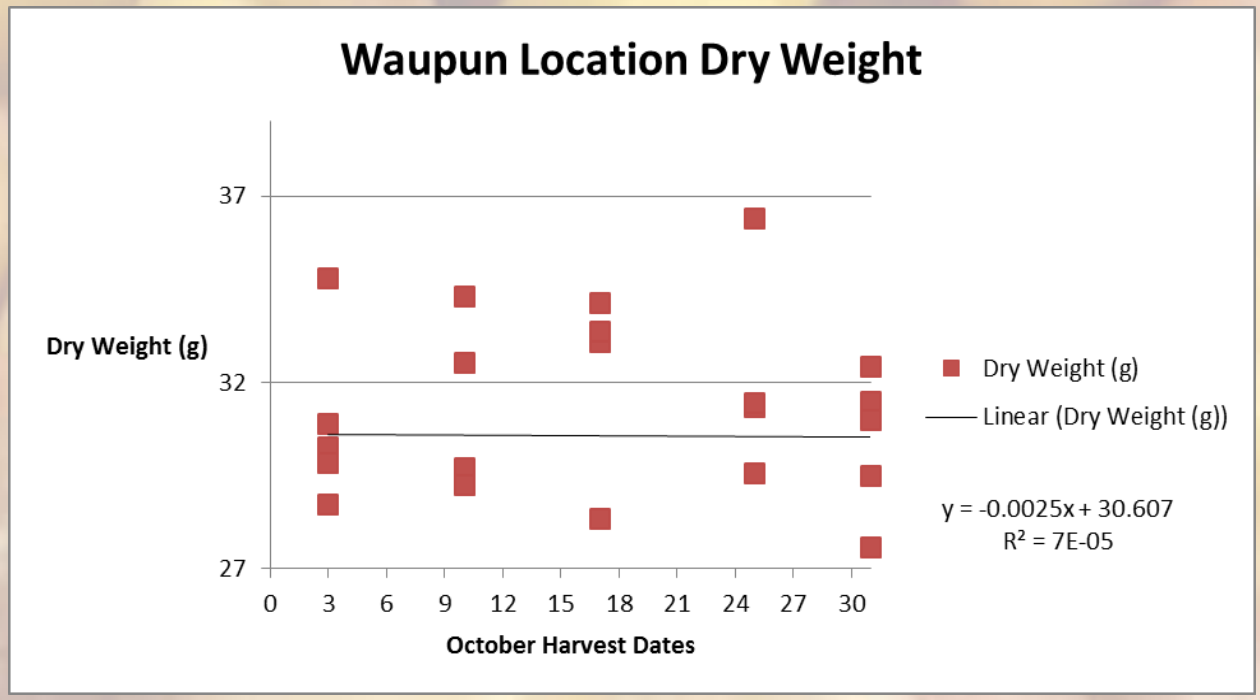

Beaver Dam Location Sample Moisture
Moisture %
32
29
26
23
20
0
3
6
9
12
15
18
21
24
27
30
October Harvest Dates
Sample Moisture
Linear (Sample Moisture)
y = -0.1918x + 28.995
R² = 0.8096

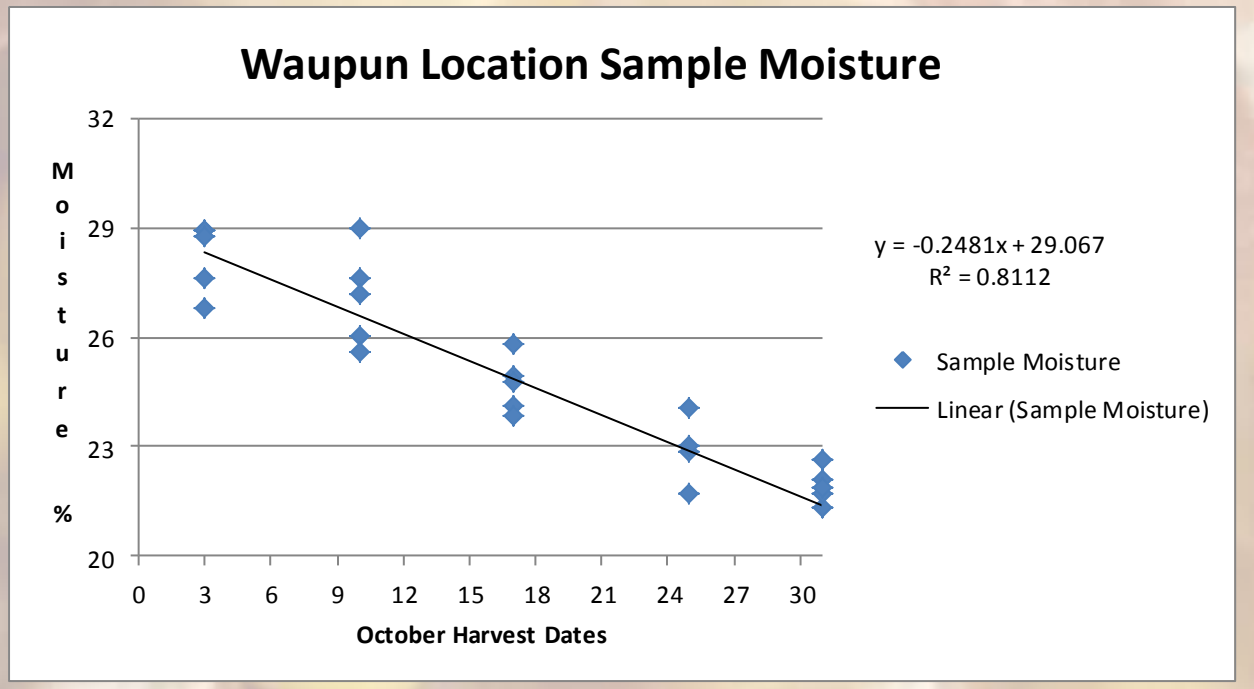

Wautoma Location Kernel Dry Weight
Dry Weight (g)
38
33
28
0
3
6
9
12
15
18
21
24
27
30
October Harvest Dates
y = 0.0511x + 35.949
R² = 0.0828
Dry Weight (g)
Linear (Dry Weight (g))


Wautoma Location Sample Moisture
Moisture %
32
29
26
23
20
0
3
6
9
12
15
18
21
24
27
30
October Harvest Dates
Sample Moisture
Linear (Sample Moisture)
y = -0.1807x + 29.963
R² = 0.7641


Columbus Location Kernel Dry Weight
Dry Weight (g)
38
33
28
0
3
6
9
12
15
18
21
24
27
30
October Harvest Dates
y = 0.0058x + 34.27
R² = 0.0004
Dry Weight (g)
Linear (Dry Weight (g))


Columbus Location Sample Moisture
Moisture %
32
29
26
23
20
17
0
3
6
9
12
15
18
21
24
27
30
October Harvest Dates
y = -0.2228x + 25.587
R² = 0.414
Sample Moisture
Linear (Sample Moisture)


Waupun Location Dry Weight
Dry Weight (g)
37
32
27
0
3
6
9
12
15
18
21
24
27
30
October Harvest Dates
Dry Weight (g)
Linear (Dry Weight (g))
y = -0.0025x + 30.607
R² = 7E-05


Waupun Location Sample Moisture
Moisture %
32
29
26
23
20
0
3
6
9
12
15
18
21
24
27
30
October Harvest Dates
y = -0.2481x + 29.067
R² = 0.8112
Sample Moisture
Linear (Sample Moisture)

Results and Discussion

- This 2013 data from one hybrid in four different locations indicated dry weight was not affected during grain moisture loss
- The differing environment and soil types did not have a significant effect on dry matter
- No visual differences observed within hybrid between locations

Discussion- Why is this data different than what farmers report?

- Kernel moisture and weight often estimated in the field by portable electronic measuring tools
  - Errors can occur if not calibrated correctly
- Utilizing oven drying to determine kernel dry weights can help alleviate potential sampling error
- Kernels from all positions on the ear may also potentially have an interaction

Discussion- Further Work

Multiple environments, hybrids, & years would help provide additional information for growers on the subject

More work comparing different parts of the ear would also be stimulating

Recommendation for Selected Cultivar

P9917AMX

- Harvest timing should not be selected based upon minimizing dry matter losses

- This hybrid offers a wide range of moisture levels to successfully harvest economically

Questions?

References

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Elmore, R. and F. Roeth. 1999. Corn Kernel Weight and Grain Yield Stability during Post-Maturity Drydown. Journal of Production Agriculture. Volume 12, no. 2. June 1999

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McNeill and M Montross. Corn Harvesting, Handling, Drying, and Storage. (http://www2.ca.uky.edu/agc/pubs/id/id139/harvesting.pdf)

Neilsen, R.L., G. Brown, K. Wuethrich, and A. Halter. 1996. Kernel Dry Weight Loss During Post-Maturity Drydown Intervals in Corn. (http://www.agry.purdue.edu/ext/corn/research/rpt94-01.htm)

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