Corn kernel weight during post-black layer drydown

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

- Hybrid Maturity
- Planting Date
- Harvest Schedule
Motivation for this Creative Component

191.2 Bu/Acre 24.3% Moisture

180.6 Bu/Acre 18.4% Moisture
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

<table>
<thead>
<tr>
<th>Date</th>
<th>Sampled Row</th>
<th>Sampled Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-Oct</td>
<td>Row 2</td>
<td>3 paces in from South Alley</td>
</tr>
<tr>
<td>10-Oct</td>
<td>Row 7</td>
<td>3 paces in from South Alley</td>
</tr>
<tr>
<td>17-Oct</td>
<td>Row 2</td>
<td>5 Paces in from South Alley</td>
</tr>
<tr>
<td>24-Oct</td>
<td>Row 7</td>
<td>5 Paces in from South Alley</td>
</tr>
<tr>
<td>31-Oct</td>
<td>Row 2</td>
<td>8 Paces in from South Alley</td>
</tr>
</tbody>
</table>
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:
  \[
  \frac{((\text{wet weight} - \text{dry weight})/ \text{wet weight}) \times 100}{100}
  \]
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

*DuPont Pioneer P9917AMX*

- 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
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
Site Description-Beaver Dam, WI

• Planting Date: May 15\textsuperscript{th}

• 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

Precipitation

Temperature / GDU
Site Description-Columbus, WI

- Planting Date: May 8\textsuperscript{th}

- 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
y = -0.2228x + 25.587
R² = 0.414

October Harvest Dates

Columbus Location Sample Moisture

y = -0.2228x + 25.587
R² = 0.414

October Harvest Dates
Waupun Location Dry Weight

\[ y = -0.2481x + 29.067 \]
\[ R^2 = 0.8112 \]

October Harvest Dates

Waupun Location Sample Moisture

\[ y = -0.2481x + 29.067 \]
\[ R^2 = 0.8112 \]
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


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