Performance of Corn Silage Hybrid Types

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Overview

• What do we want in corn silage hybrids?
• What are the available corn hybrid types?
• How have these types performed?
• How should you approach hybrid selection decisions?
## Yield and Digestibility of Corn Plant Parts

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Percent Yield</th>
<th>Digestibility (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf blades</td>
<td>11</td>
<td>73</td>
</tr>
<tr>
<td>Leaf sheaths</td>
<td>4</td>
<td>63</td>
</tr>
<tr>
<td>Stalk+tassel</td>
<td>19</td>
<td>60</td>
</tr>
<tr>
<td>Cob+husk+shank</td>
<td>22</td>
<td>72</td>
</tr>
<tr>
<td>Kernels</td>
<td>44</td>
<td>94</td>
</tr>
<tr>
<td>Whole plant</td>
<td>100</td>
<td>71</td>
</tr>
</tbody>
</table>

*Adapted from Deinum and Struik, 1989*
Desirable Forage Characteristics

• What makes a good forage? (Carter et al., 1991)
  ✓ High yield
  ✓ High energy (high digestibility)
  ✓ High intake potential (low fiber)
  ✓ High protein
  ✓ Proper moisture at harvest for storage

• Ultimate test is animal performance
  ✓ Milk2000 is our best predictor for performance (Schwab - Shaver equation)
### What Do We Want in Grain versus Forage Hybrids?

<table>
<thead>
<tr>
<th>Trait</th>
<th>Grain</th>
<th>Forage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain yield</td>
<td>High</td>
<td>Adequate</td>
</tr>
<tr>
<td>Forage yield</td>
<td>Adequate</td>
<td>High</td>
</tr>
<tr>
<td>Hybrid range</td>
<td>60 bu/A</td>
<td>8,000 lb Milk/A</td>
</tr>
<tr>
<td>Stalks</td>
<td>Standability</td>
<td>Digestibility</td>
</tr>
<tr>
<td>Leaves</td>
<td>Unknown</td>
<td>Digestibility</td>
</tr>
<tr>
<td>Kernel hardness</td>
<td>Hard</td>
<td>Soft</td>
</tr>
<tr>
<td>Plant drydown</td>
<td>“Stay-green”</td>
<td>Synchronous</td>
</tr>
<tr>
<td>Plant maturity</td>
<td>“Full-season”</td>
<td>5-10 d longer</td>
</tr>
</tbody>
</table>
### Corn Hybrid Types

<table>
<thead>
<tr>
<th>Normal</th>
<th>Dwarf corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bmr</td>
<td>“Sugar” corn</td>
</tr>
<tr>
<td>Leafy</td>
<td>Profusely-tillering</td>
</tr>
<tr>
<td>High protein</td>
<td>Autotetraploid</td>
</tr>
<tr>
<td>High oil</td>
<td>Teosinte</td>
</tr>
<tr>
<td>Waxy</td>
<td>Sweet corn</td>
</tr>
<tr>
<td>Transgenic</td>
<td>Pop corn</td>
</tr>
<tr>
<td>✓ Bt</td>
<td></td>
</tr>
<tr>
<td>✓ RR</td>
<td></td>
</tr>
<tr>
<td>✓ Bt,LL</td>
<td>Questionable value due to lower yield and poorer agronomics.</td>
</tr>
<tr>
<td>✓ Bt,RR</td>
<td></td>
</tr>
</tbody>
</table>
Number of hybrids tested in the UW Corn Silage Performance Trials

<table>
<thead>
<tr>
<th>Year</th>
<th>1-yr</th>
<th>2-yr</th>
<th>3-yr</th>
<th>4-yr</th>
<th>5-yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 2002 Wisconsin Corn Hybrid Performance Trial Results

**Table 13. South Central Zone - Early Maturity Silage Trial.**

100 DAY RELATIVE MATURITY OR EARLIER, BASED ON COMPANY RATING (FOND DU LAC = FON, GALESVILLE = GAL)

<table>
<thead>
<tr>
<th>BRAND</th>
<th>HYBRID</th>
<th>2002 Average</th>
<th>2001 Average</th>
<th>2 Year Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yield T/A</td>
<td>MILK PER TON ACRE</td>
<td>Moist %</td>
</tr>
<tr>
<td>Dekalb</td>
<td>DKC4446</td>
<td>8.8</td>
<td>3380 30000</td>
<td>48.1</td>
</tr>
<tr>
<td>Golden Harvest</td>
<td>H2387</td>
<td>8.9</td>
<td>3440 30900 *</td>
<td>54.7</td>
</tr>
<tr>
<td>Dairyland</td>
<td>HiDF3300</td>
<td>8.9</td>
<td>3440 30800 *</td>
<td>55.7</td>
</tr>
<tr>
<td>Golden Harvest</td>
<td>H6775Bt</td>
<td>8.8</td>
<td>3350 29800</td>
<td>57.0</td>
</tr>
</tbody>
</table>

100-DAY HYBRID TRIAL AVERAGE## 58.7

<table>
<thead>
<tr>
<th>BRAND</th>
<th>HYBRID</th>
<th>2002 Average</th>
<th>2001 Average</th>
<th>2 Year Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growmark</td>
<td>FS4042Bt</td>
<td>9.7 *</td>
<td>3400 33100 *</td>
<td>58.9</td>
</tr>
<tr>
<td>La Crosse Forage</td>
<td>LC7415</td>
<td>8.8</td>
<td>3380 29900</td>
<td>59.2</td>
</tr>
<tr>
<td>Garst</td>
<td>8779</td>
<td>9.2</td>
<td>3430 31600 *</td>
<td>59.3</td>
</tr>
<tr>
<td>Battleground</td>
<td>3195</td>
<td>7.8</td>
<td>3370 26500</td>
<td>59.4</td>
</tr>
<tr>
<td>LG Seeds</td>
<td>LG2488</td>
<td>8.6</td>
<td>3320 28700</td>
<td>61.5</td>
</tr>
</tbody>
</table>

Dekalb | DKC5073 | 8.7 | 3340 29000 | 62.0 | 40 | 7.1 | 25 | 47 | 81 | 59 | 35 | 8.5 | 8.9 |
| NK Brand | N48V8 | 10.7 * | 3380 36100 * | 63.2 | 40 | 7.1 | 28 | 52 | 80 | 62 | 27 | 10.2 * | 11.1 * |
| Battleground | 3203 | 8.9 | 3330 29700 | 63.9 | 50 | 7.4 | 27 | 50 | 80 | 60 | 32 | 8.9 | 8.9 |

MEAN 9.0 | 3380 30500 | 58.6 | 30 | 7.2 | 25 | 48 | 81 | 61 | 34 | 8.2 | 9.8 |
| LSD(0.10)** | 1.2 | NS | 5800 | 5.2 | 10 | 0.5 | 3 | 5 | 2 | 2 | 5 | 1.0 | 1.4 |

## Average whole plant moisture of all hybrids in the trial as rated by the Minnesota Relative Maturity Rating System. Ratings are rounded to 5 day increments.

* Hybrids that performed statistically similar to the highest hybrid in the trial.

Shaded results provide the best estimate of relative hybrid performance.
Performance Indices
Milk per Ton and Milk per Acre

• **Milk per ton:** The amount of milk production from one ton of silage using the quality measures of crude protein, NDF, *invitro* true digestibility, NDFD, and starch content.
  - Estimate is based on a standard cow body weight of 1350 pounds
  - Milk production level of 90 pounds milk per day at 3.8 percent fat.
  - Adjusted for maturity

• **Milk per acre** = Milk per ton X Dry matter yield per acre
Relative Performance of Corn Hybrids Tested in the UW Silage Trials (1995-2003). Each value is a GxE mean (n=3263).

Oval = ± Standard error of the mean (95% C.L.)

- **Bmr (n=51)**
- **Annual Average**
- **Overall Average**

Oval = + Standard error of the mean (95% C.L.)

Leafy (n=110)
Annual Average
Overall Average

Milk per Acre (lb/A)
Milk per Ton (lb/T)

Oval = + Standard error of the mean (95% C.L.)

- **ND (n=22)**
- **Annual Average**
- **Overall Average**

![Graph showing milk production vs. milk per ton for corn high oil types. The graph includes data points for annual averages and overall averages, with an oval indicating the standard error of the mean (95% C.L.).]

Oval = ± Standard error of the mean (95% C.L.)

- **Waxy (n=48)**
- **Annual Average**
- **Overall Average**

![Graph showing relative performance of corn waxy types.](image-url)

Oval = + Standard error of the mean (95% C.L.)

- **Bt (n=407)**
- **Annual Average**
- **Overall Average**

Milk per Acre (lb/A)

Milk per Ton (lb/T)

Oval = \pm Standard error of the mean (95% C.L.)

- **RR (n=63)**
- **Annual Average**
- **Overall Average**

Milk per Acre (lb/A) vs. Milk per Ton (lb/T)
Relative Performance of Corn Bt,RR (Stacked) Types Tested in the UW Silage Trials (1995-2003).

Oval = + Standard error of the mean (95% C.L.)

- **Bt,RR (n=114)**
- **Annual Average**
- **Overall Average**
Relative Performance of Corn Bt,LL (Stacked) Types Tested in the UW Silage Trials (1995-2003).

Oval = ± Standard error of the mean (95% C.L.)

Oval = $\pm$ Standard error of the mean (95\% C.L.)

- Normal (n=2188)
- Leafy (n=110)
- Waxy (n=48)
- High oil (n=12)
- Nutri-Dense (n=22)
- Bt (n=407)
- RR (n=63)
- Bt,LL (n=110)
- Bt,RR (n=114)
- Bmr (n=51)

Oval = + Standard error of the mean (95% C.L.)

Carhart’s Blue Top CX1195A

- GxE (n=16)
- Annual Average
- Overall Average

Oval = + Standard error of the mean (95% C.L.)

Carhart’s Blue Top CX1080A

Milk per Acre (lb/A)

Milk per Ton (lb/T)

Oval = + Standard error of the mean (95% C.L.)

Pioneer 34M95

- GxE (n=10)
- Annual Average
- Overall Average

Milk per Acre (lb/A)
Milk per Ton (lb/T)
Each value is a hybrid mean (n= 854 hybrids)

Oval = + Standard error of the mean (95% C.L.)
Relationship between milk per acre and milk per ton of corn hybrids in Wisconsin (n=854, 1995-2003).
Summary

• Numerous methods for achieving high yield and high quality corn silage
  ✓ Many ways to “skin the cat”
  ✓ Hybrid selection depends upon objectives of farmer
  ✓ Management and hybrid selection go hand-in-hand
• Base hybrid selection decisions on performance.
  ✓ Multi-location averages
  ✓ Consistency
• Future direction
  ✓ Starch degradation
  ✓ Stover digestibility (digestion kinetics)
  ✓ Continued improvement of Milk2000
  ✓ Key: Animal feeding verification studies
Using Wisconsin Corn Hybrid Performance Trial Results

• Use multi-environment average data
  ✓ Begin with trials in zone(s) nearest you
  ✓ Compare hybrids with similar maturities
  ✓ Use many years and locations

• Evaluate consistency of performance
  ✓ Check performance in other zones and locations
  ✓ Check other reliable unbiased trials
  ✓ Be wary of inconsistent performance.

• SELECT at http://corn.agronomy.wisc.edu

• You are taking a tremendous gamble if basing your hybrid selection decisions on 1 or 2 local test plots
Criteria for Selecting Silage Hybrids

- Whole plant silage yield
- Grain yield: allows flexibility (dual purpose)
- Silage quality
- Relative maturity: 5-10 days later than grain hybrids
- Standability: allows flexibility
- Pest resistance

“Variation for silage yield and quality exists among commercial hybrids in Wisconsin.”