Reduced-lignin alfalfa
and BMR corn silage

Ev Thomas
Oak Point Agronomics, Hammond, NY
Alfalfa harvest management, 1962

Full bloom

10% bloom

U.S. average milk/cow: 7500 lbs.
Alfalfa harvest management

The graph illustrates the relationship between percent carbohydrate and stage of growth. The graph shows three stages:

1. **Bud** stage, where the percent carbohydrate levels are relatively low.
2. **10% flower** stage, where percent carbohydrate starts to increase significantly.
3. **Full flower** stage, where percent carbohydrate reaches its peak.
4. **Post flower** stage, where percent carbohydrate begins to decrease.

The graph also indicates that regrowth starts at a height of 6-8 inches.
An accumulation of insults

“Winter damage to alfalfa is an accumulation of insults.” Jerry Cherney, Cornell University forage agronomist.

Repeated harvests at the bud stage followed by aggressive fall management may be enough “insults” to deplete alfalfa stands. Not just carbs: Harvest affects rhizobial nodules and root hairs.

If 2nd, 3rd (and 4th) cut harvests are at ~30-day intervals: 50+ day interval before a fall harvest to allow the plant to accumulate taproot carbohydrates.
Enter: Reduced-lignin alfalfa
Reduced-lignin alfalfa
**Reduced-lignin alfalfa**

- Believe the hype! Reduced-lignin alfalfas are up to 20% lower in lignin than conventional varieties. HarvXtra is Roundup Ready, Hi-Gest is non-GMO.

- Technology fee for HarvXtra: $300/bag across the alfalfa seed industry.

- Reduced lignin alfalfa doesn’t have a slower rate of decline in forage quality: It’s higher in quality at all stages of development. No negative impact on standability.

- Mowing a week later than normal for each cut may result in one fewer harvests per year.
Reduced lignin alfalfa research


Reduced lignin alfalfa was 10% lower in NDF, 18% lower in lignin and 10% higher in NDF digestibility.

- University of Wisconsin: Over four years, 15-20% higher yield with 3 vs. 4 cuts of alfalfa. (Impact of less field traffic?)
Other advantages of reduced-lignin alfalfa

- More time to harvest first cut forage grasses, complete corn planting and other spring fieldwork.

- If cuts are reduced by one per season, less labor and equipment cost, less traffic damage.

- Combination of improved carbohydrate accumulation + less field traffic: One more year of stand life?

- Wide windrows are a must because of higher yield.
Working reduced-lignin alfalfa into a forage system

- Seed a portion of the alfalfa acreage to reduced-lignin alfalfa. Choose your best alfalfa land.

- Harvest any alfalfa-grass fields first, then conventional alfalfa, and finally reduced-lignin alfalfa.

- Objective: Uniformly high forage quality from the first field harvested to the last. Extends the ideal harvest window.
Reduced lignin alfalfa: The choice

- **Harvest at usual date**
  - Bud stage
  - + Extremely high forage quality

- **Delay harvest by 1 week**
  - Early bloom
  - + One fewer harvest/year
  - + Higher total yield
  - + Improved carbohydrate status
  - + Less wheel traffic damage
Cow killer?

- Cornell University harvested prebud 1st cut alfalfa-grass May 23 & 25 in two NY counties. The alfalfa was 27.4% NDF and 29.4% CP! (Similar to reduded-lignin alfalfa harvested at bud stage?) Grass NDF was in the mid-50s.

Jerry Cherney: “I am sure more than one NY farmer has cow-killing alfalfa in a bunker, if they are not careful about balancing rations. They may need to view their alfalfa as a concentrate.”
"I have tried making the case that reduced-lignin alfalfa was really invented for alfalfa-grass people, but the alfalfa group outside of NY still does not know what alfalfa-grass is, they just have a puzzled look."

- Fields with 2/3 reduced-lignin alfalfa + 1/3 grass, harvested when the alfalfa is in the bud stage, should result in excellent quality forage.

- If Roundup is applied, grass would have to be seeded after herbicide application. Worked well at Penn State.
Even reduced-lignin alfalfa doesn’t allow plants to fully accumulate carbohydrates—less stress, but still there.

However, the goal of dairy forage management is the economical production of forages that will meet the quality needs of high producing cows.

Risk can be managed, but some risk is unavoidable.

No LHR reduced-lignin alfalfa varieties.
BMR Corn Silage
An inconvenient truth

- BMR corn yields less than conventional corn.
- It always has, ever since the first Cargill BMR.
- Maybe it always will.
- Some early yield improvement vs. conventional hybrids, But…
- …no university trial data showing that BMR is doing any more “catching up” to conventional corn yields.
## BMR vs. Conventional Hybrids
### Cornell University, 2007-2008

<table>
<thead>
<tr>
<th>Year &amp; Hybrid</th>
<th>Yield drag vs. conv. hybrids, %</th>
<th>Milk/ton vs. conv. hybrids, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 Mycogen F2F485</td>
<td>4</td>
<td>+11</td>
</tr>
<tr>
<td>2007 Mycogen F2F566</td>
<td>6</td>
<td>+8</td>
</tr>
<tr>
<td>2007 Mycogen F2F610</td>
<td>13</td>
<td>+9</td>
</tr>
<tr>
<td>2007 Mycogen F2F721</td>
<td>15</td>
<td>+10</td>
</tr>
<tr>
<td>2008 Mycogen F2F487</td>
<td>8</td>
<td>+12</td>
</tr>
<tr>
<td>2008 Mycogen F2F566</td>
<td>14</td>
<td>+10</td>
</tr>
<tr>
<td>2008 Mycogen F2F610</td>
<td>9</td>
<td>+9</td>
</tr>
<tr>
<td>2008 Mycogen F2F487</td>
<td>19</td>
<td>+11</td>
</tr>
<tr>
<td>2008 Mycogen F2F566</td>
<td>23</td>
<td>+9</td>
</tr>
<tr>
<td>2008 Mycogen F2F610</td>
<td>12</td>
<td>+11</td>
</tr>
<tr>
<td>2008 Mycogen F2F725</td>
<td>14</td>
<td>+8</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>12</strong></td>
<td><strong>+10</strong></td>
</tr>
</tbody>
</table>
## BMR vs. Conventional Hybrids

### University trials, 2012-2013

<table>
<thead>
<tr>
<th>Year &amp; Trial</th>
<th>Hybrid</th>
<th>Yield drag vs. conv., %</th>
<th>Milk/ton vs. conv., %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012 Penn State</td>
<td>Mycogen F2F665</td>
<td>26</td>
<td>-5</td>
</tr>
<tr>
<td></td>
<td>Pioneer 1376XR</td>
<td>17</td>
<td>+3</td>
</tr>
<tr>
<td></td>
<td>Mycogen F2F795</td>
<td>10</td>
<td>+5</td>
</tr>
<tr>
<td>2012 Wisconsin</td>
<td>Pioneer 1449XR</td>
<td>8</td>
<td>+4</td>
</tr>
<tr>
<td>2013 Wisconsin</td>
<td>Pioneer 1449XR</td>
<td>6</td>
<td>+2</td>
</tr>
<tr>
<td>2013 Penn State</td>
<td>Mycogen F2F626</td>
<td>8</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>Mycogen F2F795</td>
<td>12</td>
<td>+11</td>
</tr>
<tr>
<td></td>
<td>Pioneer 1449XR</td>
<td>9</td>
<td>-1</td>
</tr>
<tr>
<td>2013 Cornell</td>
<td>Mycogen F2F627</td>
<td>15</td>
<td>+5</td>
</tr>
<tr>
<td></td>
<td>Pioneer 1449XR</td>
<td>10</td>
<td>+2</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td></td>
<td><strong>13</strong></td>
<td><strong>+3</strong></td>
</tr>
</tbody>
</table>

**Mycogen (BM-3): 14% yield drag, +3% milk/ton**  
**Pioneer (BM-1): 10% yield drag, +2% milk/ton**
BMR genes: BM-1, BM-3
...or is it all BS?
### BMR Corn Hybrid Trial

4 Mycogen and 2 Pioneer 110-116 RM hybrids

Average of four sites in southern PA

<table>
<thead>
<tr>
<th></th>
<th>% DM</th>
<th>T/A @ 35% DM</th>
<th>Starch</th>
<th>Lignin</th>
<th>24-hr NDF-d</th>
<th>Milk/T</th>
<th>Milk/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mycogen</td>
<td>35.8</td>
<td>18.7</td>
<td>31.3</td>
<td>2.8</td>
<td>58.4</td>
<td>3405</td>
<td>22527</td>
</tr>
<tr>
<td>Pioneer</td>
<td>37.7</td>
<td>18.6</td>
<td>33.4</td>
<td>2.6</td>
<td>53.4</td>
<td>3428</td>
<td>22546</td>
</tr>
<tr>
<td><em>Conv.</em></td>
<td>38.9</td>
<td>24.1</td>
<td>37.0</td>
<td>3.1</td>
<td>48.7</td>
<td>3180</td>
<td>27144</td>
</tr>
</tbody>
</table>

*Conventional hybrids: Average of 3 sites.
Conventional hybrid NDF-d via NIR. BMR NDF-d via wet chemistry.
Several chewing studies comparing BMR vs. conventional CS: Cows ate more BMR and ruminated 20-25 minutes less per pound of NDF consumed.

Cows on the BMR ration spent 5-10 minutes less time eating per pound of NDF consumed.

That adds up to significantly less time at the feed bunk--30 minutes less/day in one study. Particularly important if bunk space is limited by high stocking rates.
BMR is just different

- BMR cell walls are more fragile. May need to chop BMR at more than 19-20 mm to get enough physically effective fiber.

- Cows need a certain amount of chewing for optimum rumen function.

- Therefore, feed a high % of forage when using BMR, supplement with less digestible, lower fragility forages: straw or late-cut grass.
BMR response is rate-dependent

- For a good milk response, BMR should be at least 20% of total ration DMI. Optimum: 30+%.

- Miner Institute: BMR in four rations, feeding rates range from 11 to 15 lbs DM. High group cows: 29 lbs CS DM (85% of forage DM). BMR is 22% of total ration DMI.

- Current research project: 25 lbs BMR DM (44% of ration DMI), 5 lbs haylage, 1 ¼ lbs straw. 55% forage-to-grain ratio.
BMR corn is just different

• It looks different.
• It grows different.
• It tests different.
• Fiber fragility is different.
• It feeds different.
• Some say it even tastes different!

Top: Conventional hybrid
Bottom: BMR hybrid
Foliar fungicides for BMR corn


Mycogen BMR hybrids were most affected but Pioneer BMRs were also blighted.

Many Pennsylvania farmers apply fungicides on their BMR corn—but only on BMR.
Should you or shouldn’t you?

A tough call because most fungicide research has been with corn harvested for grain.

Fungicide more likely to be needed ( economical ) when:

- Previous crop corn harvested for grain.
- Foliar disease present in the previous corn crop.
- Low fields, fields surrounded by trees, river bottom.
- Rainy, humid summer conditions.
- Low foliar disease ratings. 6+ OK, BMRs range 4-8.
- Narrow rows? Possibly, but no data!
Decision time

- For a single application, best time is tasseling through silking/blister stage.

- Early application (V5)—five leaves with collars—is probably too early because the fungicide will be gone by the time disease hits.

- Disease lesions covering >5% of the leaf area on or above the ear leaf at silking: Consider using a foliar fungicide.

- BMR silage is worth more per ton...
Focus on what’s important

- BMR corn silage is such a different forage that it’s almost a different species: *Zea mays* vs. *Zea BMR*.

- Fed at the right rate to the right cows, BMR should result in a 3 to 5 lb milk response.

- A milk response of 3 to 5 pounds will pay for a lot of “yield drag” and other in-field challenges of BMR corn.

- BMR has challenges, but it puts milk in the tank.
Shorter crop rotations can reduce per-acre production costs while increasing yields.

Drought-resistant corn hybrids are new, but more efficient water utilization by corn isn't new at all.

For superior corn silage NDF digestibility, BMR is the only alternative.

Reduced lignin alfalfa is the real deal.