Study Location

- **Amarillo, TX**
  - **Rainfall**
    - 19 inches, 10 inches seasonal
  - **Elevation**
    - 3500 ft
  - **Soil**
    - Silty, clay loam
    - pH, 7.4
    - O.M., 1.2%
Study Cultural Practices

- Four, 30 inch bedded rows
- Furrow irrigation
- 120,000 Seed rate
- Hand harvested
  - Soft dough
Corn vs. Sorghum Silage

- Corn has been the silage of choice for our beef cattle feedyards and growing number of dairies.
- Quality of silage is the number one reason given for choosing corn over sorghum silage.
- Problem: Corn requires irrigation water, and lots of it.
Variety, Grazing, and Silage Feeding Trials Since 1999

BMR  Conventional Corn
PS    BMR-PS
      Sorghum/sudangrass
Photoperiod Sensitive (PS) Sorghums

- Forage Sorghum or Sorghum/Sudan
- Remain in vegetative stage until day length is less than about 12 hr and 20 min. (about Sep 20th)
- Very high yield produced per acre
- Hard to dry
- Quality for silage is questionable
BMR – Brown Midrib Characteristic

Color varies from reddish-brown to dark brown and is visibly evident on leaves and stems.
Brown Mid-Rib Sorghums (BMRs)

- Forage Sorghums
- Sorghum-Sudangrass hybrids
- Lower lignin content in leaves and stalks
  - Higher digestibility
  - Thus higher feeding value and palatability
- Lodging can be a problem if not harvested promptly
2001 Irrigated Sorghum Silage Yields

Forage Sorghums (43) Excludes PS, HG, & GS

Haygrazers (2)

Photoperiod Sensitive (6)

BMRs (20)

Non-BMRs (25) Excludes BMRs, PS, & GS

Corn

Tons/Acre

<table>
<thead>
<tr>
<th>Category</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage Sorghums</td>
<td>24.5</td>
</tr>
<tr>
<td>Haygrazers</td>
<td>23.5</td>
</tr>
<tr>
<td>Photoperiod Sensitive</td>
<td>33</td>
</tr>
<tr>
<td>BMRs</td>
<td>23.1</td>
</tr>
<tr>
<td>Non-BMRs</td>
<td>25.6</td>
</tr>
<tr>
<td>Corn</td>
<td>23.8</td>
</tr>
</tbody>
</table>

10.8% increase compared to UCD Alfalfa Workgroup
Comparison of Sorghum Types for Silage Yield -- 2003

![Graph showing silage yield comparison for different sorghum types. The graph indicates that UCD Alfalfa Workgroup achieved a 26.6% increase in silage yield compared to other types.]
# Nutrient analyses – 2001

## Bushland

<table>
<thead>
<tr>
<th>Type</th>
<th>CP, %</th>
<th>ADF, %</th>
<th>NDF, %</th>
<th>Lignin, %</th>
<th>IVTD, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>9.0</td>
<td>23.9</td>
<td>41.2</td>
<td>3.5</td>
<td>82.7</td>
</tr>
<tr>
<td>Range (4)</td>
<td>8.4 to 9.7</td>
<td>18.2 to 27.4</td>
<td>33.7 to 45.8</td>
<td>2.7 to 4.2</td>
<td>78.3 to 88.1</td>
</tr>
<tr>
<td>BMR</td>
<td>9.2</td>
<td>27.6</td>
<td>45.9</td>
<td>3.6</td>
<td>81.3</td>
</tr>
<tr>
<td>Range (20)</td>
<td>6.9 to 10.5</td>
<td>24.3 to 35.0</td>
<td>40.7 to 60.1</td>
<td>2.8 to 4.5</td>
<td>75.1 to 84.2</td>
</tr>
<tr>
<td>Non-BMR</td>
<td>8.3</td>
<td>29.9</td>
<td>49.1</td>
<td>4.4</td>
<td>75.5</td>
</tr>
<tr>
<td>Range (25)</td>
<td>6.3 to 10.8</td>
<td>21.3 to 41.7</td>
<td>33.9 to 67.5</td>
<td>2.7 to 6.4</td>
<td>60.9 to 83.6</td>
</tr>
</tbody>
</table>

UCD Alfalfa Workgroup
Acid Detergent Fiber and In Vitro True Digestibility

UCD Alfalfa Workgroup
Grain Content and IVTD

% Grain in Silage

IVTD, % DM

NonBMR

BMR

UCD Alfalfa Workgroup

AgriLIFE EXTENSION Texas A&M System
Silage Yield vs % IVTD, Bushland, TX variety trials
(the yellow lines represent averages for corn silage grown in the trials) 3 Years
Corn vs Sorghum, In-Season Irrigation Water Use

- **2001**
  - Sorghum, pre + 13.2 inches, **24.5 ton/ac**
  - Corn, pre + 28.2 inches, **23.8 ton/ac**
  - Difference: **53% less water for sorghum**

- **2002**
  - Sorghum, pre + 14.5 inches, **26.9 ton/ac**
  - Corn, pre + 24.6 inches, **25 ton/ac**
  - Difference: **41% less water for sorghum**

- **2003**
  - Sorghum, pre + 22.2 inches, **19.2 ton/ac**
  - Corn, pre + 37.3 inches, **25.5 ton/ac**
  - Difference: **40% less water for sorghum**

- **2004 (2005 was similar)**
  - Sorghum, pre + 12.2 inches, **20.8 ton/ac**
  - Corn, pre + 12.2 inches, **19.2 ton/ac**
  - Difference: **Same water used**
Response of Forage Sorghum Hybrids to Irrigation Amount

Study

- Four Hybrids
  - Two BMR F. Sorghums
  - One Non BMR F. Sorghum
  - One PS BMR F. Sorghum

- Irrigation Levels
  - Dryland
  - 4 inches
  - 8 inches
  - 16 inches
2003 Forage Sorghum Yield per Acre-Inch of Water

y = 0.6937x

R² = 0.918
Water use and yield of BMR forage sorghum and corn
Bushland, TX 2007
Howell. *in* Wetting Front Newsletter. ARS Vol.10, No. 1

<table>
<thead>
<tr>
<th>Species</th>
<th>Yield, ton/Acre @ 66% Moist.</th>
<th>Water Use, ton/ac-inch</th>
<th>Difference in Water Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMR F. Sorghum</td>
<td>22.7</td>
<td>1.17</td>
<td>27% Less</td>
</tr>
<tr>
<td>Corn</td>
<td>32.7</td>
<td>1.24</td>
<td></td>
</tr>
</tbody>
</table>
Percent lodging at harvest (soft-dough stage) of BMR and NonBMR forage sorghum

<table>
<thead>
<tr>
<th>Year</th>
<th>BMR Forage Sorghum</th>
<th>NonBMR Forage Sorghum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% lodging (range)</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>14.6 (0 – 50 %)</td>
<td>18.7 (0 - 77 %)</td>
</tr>
<tr>
<td>2002</td>
<td>11.8 (0 – 50 %)</td>
<td>8.7 (0 – 45 %)</td>
</tr>
<tr>
<td>2003</td>
<td>14.4 (2 – 50 %)</td>
<td>4.2 (0 – 27 %)</td>
</tr>
</tbody>
</table>
Lodging of BMR and NonBMR Forage Sorghum -- 2003

% Lodging

Non BMR
BMR

UCD Alfalfa Workgroup
2003 Study

Seeding Rate, N Rate, and Variety Effect on Lodging

Seeding Rates: 30,000, 60,000, 120,000
N Rates: 50 lbs, 100 lbs
Varieties: BMR 100, BMR 106
Hybrid, N, and Seeding Rate Effect on Lodging of F. Sorghum - 2003

% Lodged Plants

- BMR 100
- BMR 106

Rate, N/ac

50 lb
100 lb
30,000
60,000
120,000

Rate, Seed/ac
Hybrid, N, and Seeding Rate Effect on Yield of F. Sorghum - 2003

% Yield, Ton/acre

- BMR 100
- BMR 106

Rate, N/ac
- 50 lb
- 100 lb

Rate, Seed/ac
- 30,000
- 60,000
- 120,000
A summary of six years of forage sorghum variety trials is presented in Tables 1 and 2. Trials were conducted from 2000 to 2005 at the Texas Agricultural Experiment Station Bush Farm, located approximately 8 miles west of Amarillo. Only those varieties that were entered in the trials for at least three years are included. A summary of the results along with the procedures used in conducting the trials for any given year can be found at http://amarillo.tamu.edu.
Indexing Forage Sorghum to Corn

- Each year all sorghum variety data was compared to corn.
  - This was done by calculating the ratio of each sorghum data point to corn and averaging over years.

- **Example**
  
<table>
<thead>
<tr>
<th>Year</th>
<th>Variety B Yield, ton/Ac</th>
<th>Corn Yield, ton/Ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>20</td>
<td>22</td>
</tr>
<tr>
<td>2003</td>
<td>22</td>
<td>26</td>
</tr>
<tr>
<td>2004</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

Average yield Var. B relative to corn:

\[
\frac{.92 + .85 + 1}{3} \times 100 = 92.3\%
\]
### Sorghum Types when Index to Corn 2000 - 2005

<table>
<thead>
<tr>
<th>Forage Sorghum Type</th>
<th>Silage Ton/Ac</th>
<th>Crude Protein, %</th>
<th>ADF, %</th>
<th>NDF, %</th>
<th>IVTD, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. Sorg Conv (27)</td>
<td>100.0</td>
<td>87.8</td>
<td>106.6</td>
<td>107.0</td>
<td>94.2</td>
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<tr>
<td>F. Sorg BMR (17)</td>
<td>85.9</td>
<td>95.6</td>
<td>101.0</td>
<td>102.3</td>
<td>100.4</td>
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<tr>
<td>F. Sorg PS (4)</td>
<td>119.6</td>
<td>75.2</td>
<td>143.8</td>
<td>142.4</td>
<td>85.5</td>
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<tr>
<td>F. Sorg PS BMR (2)</td>
<td>85.3</td>
<td>74.2</td>
<td>134.2</td>
<td>138.8</td>
<td>95.7</td>
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<tr>
<td>G. Sorghum (4)</td>
<td>80.2</td>
<td>103.7</td>
<td>90.0</td>
<td>90.4</td>
<td>100.3</td>
</tr>
</tbody>
</table>
Sample of Summary of 00-05 Sorghum Varieties Indexed to Corn

<table>
<thead>
<tr>
<th>Num Yrs</th>
<th>Variety</th>
<th>Silage (Ton/Ac)</th>
<th>IVTD, %</th>
<th>Yield, 90% of Corn</th>
<th>% IVTD, 95% of Corn</th>
<th>10% or Less Lodging</th>
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<tbody>
<tr>
<td>6</td>
<td>979</td>
<td>89.0</td>
<td>95.7</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>6</td>
<td>2-Way SRS</td>
<td>108.1</td>
<td>90.3</td>
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<td>6</td>
<td>4 Ever Green</td>
<td>124.0</td>
<td>86.9</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>6</td>
<td>811F</td>
<td>115.5</td>
<td>85.5</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>6</td>
<td>A571 (check)</td>
<td>82.8</td>
<td>99.4</td>
<td>X</td>
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<tr>
<td>6</td>
<td>Canex BMR 208</td>
<td>84.3</td>
<td>102.4</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>6</td>
<td>Dairy Master BMR</td>
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<tr>
<td>6</td>
<td>FS-25E</td>
<td>123.6</td>
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<td>X</td>
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<tr>
<td>6</td>
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<td>106.4</td>
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<td>X</td>
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<td>X</td>
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<tr>
<td>6</td>
<td>Maxi Gain</td>
<td>125.4</td>
<td>85.3</td>
<td>X</td>
<td></td>
<td>X</td>
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<td>6</td>
<td>Millennium</td>
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<td>104.0</td>
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<tr>
<td>6</td>
<td>Nutri-Choice II</td>
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<td>94.2</td>
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<td>X</td>
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<tr>
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<td>P84G62 (check)</td>
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<td>98.8</td>
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<tr>
<td>6</td>
<td>RedTop Plus BMR</td>
<td>84.8</td>
<td>100.6</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
http://amarillo.tamu.edu
All program
Agronomy
Forage sorghum