

Forage Sorghum and Silage Corn: Yield, Quality and Water

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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
PS

Conventional
BMR-PS
Sorghum/sudangrass

Corn



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

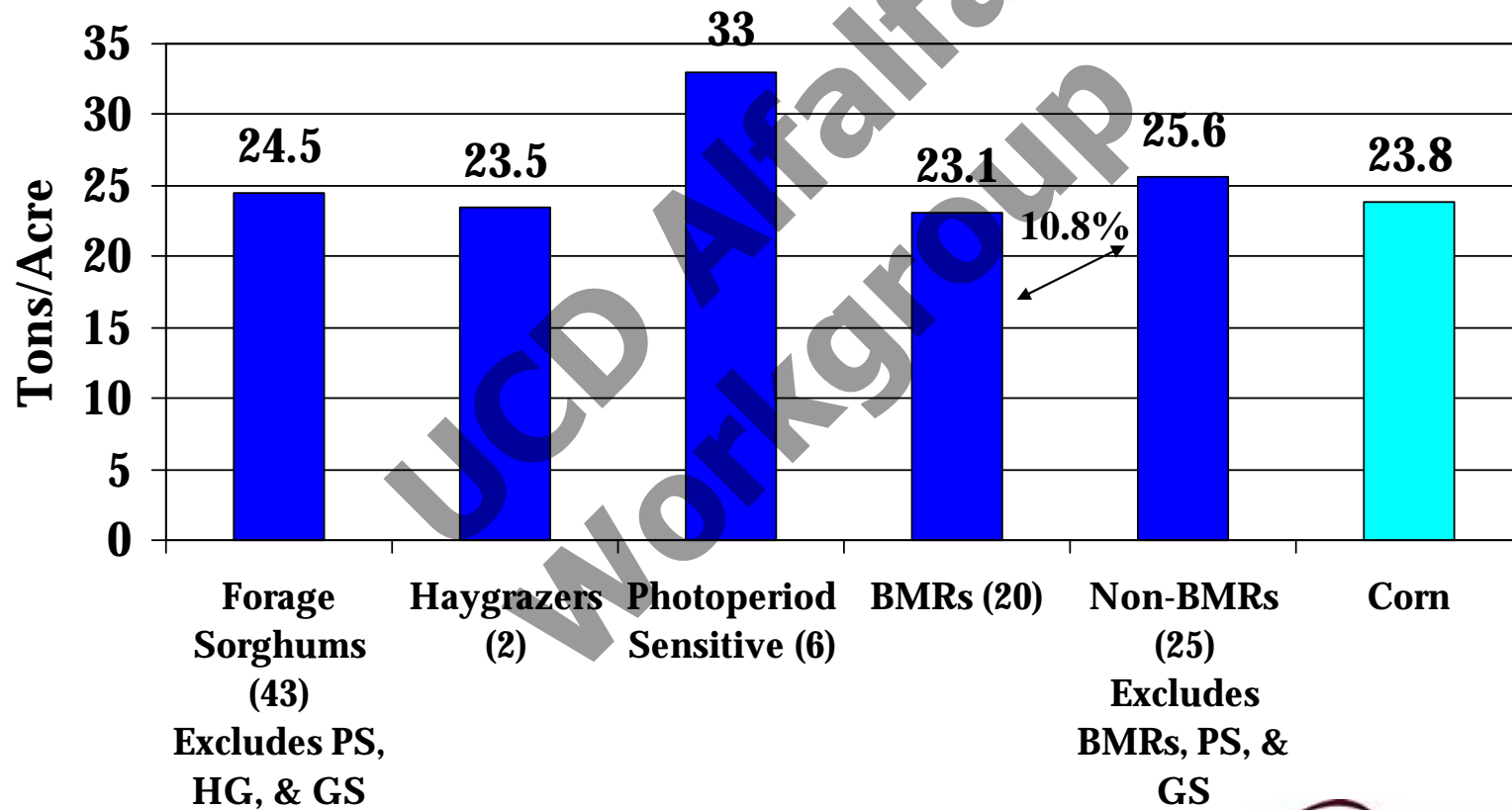
Color varies from reddish-brown to dark brown and is visibly evident on leaves and stems



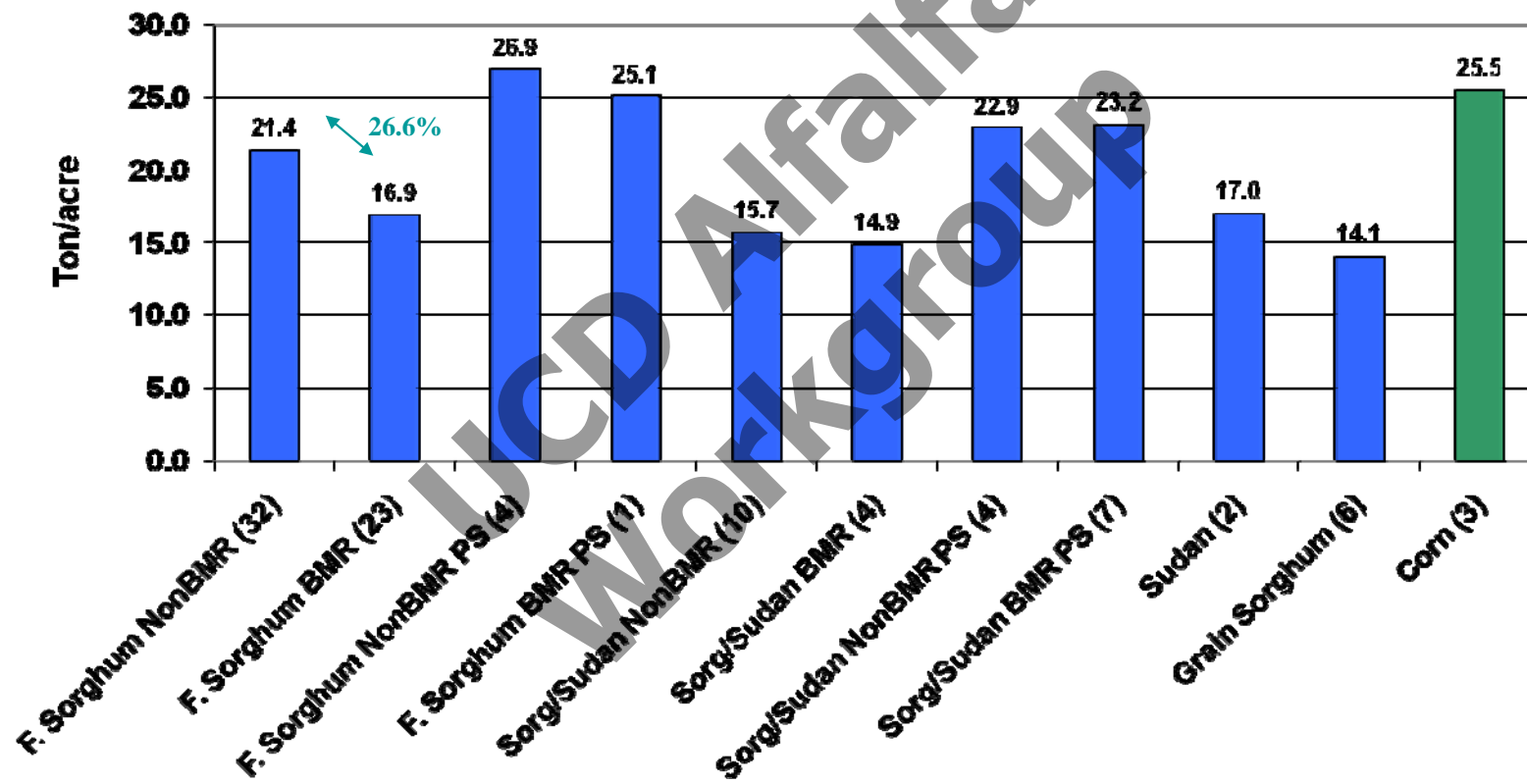
Brown Mid-Rib Sorghums (BMRs)

- 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



Comparison of Sorghum Types for Silage Yield -- 2003

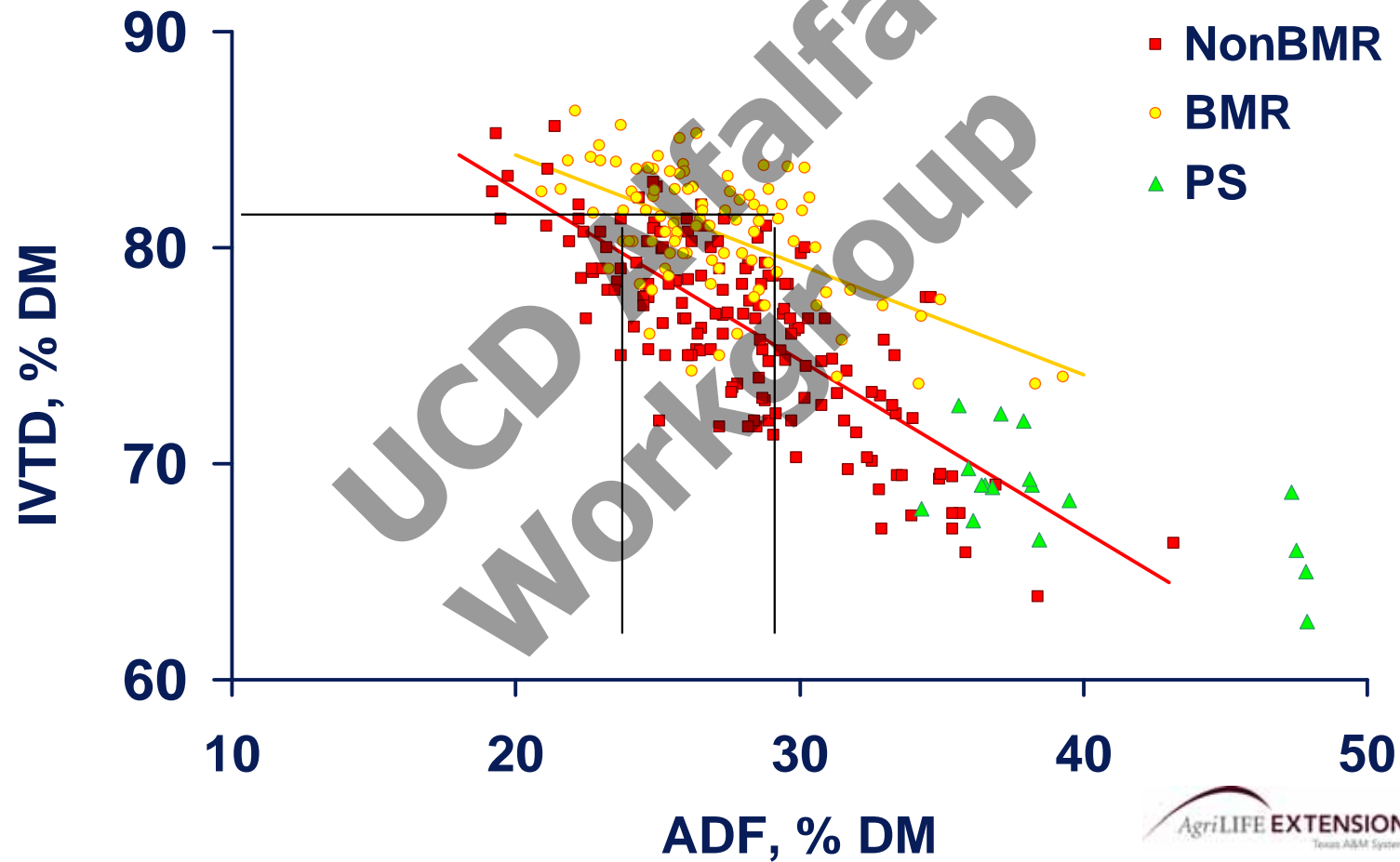


Nutrient analyses – 2001 Bushland

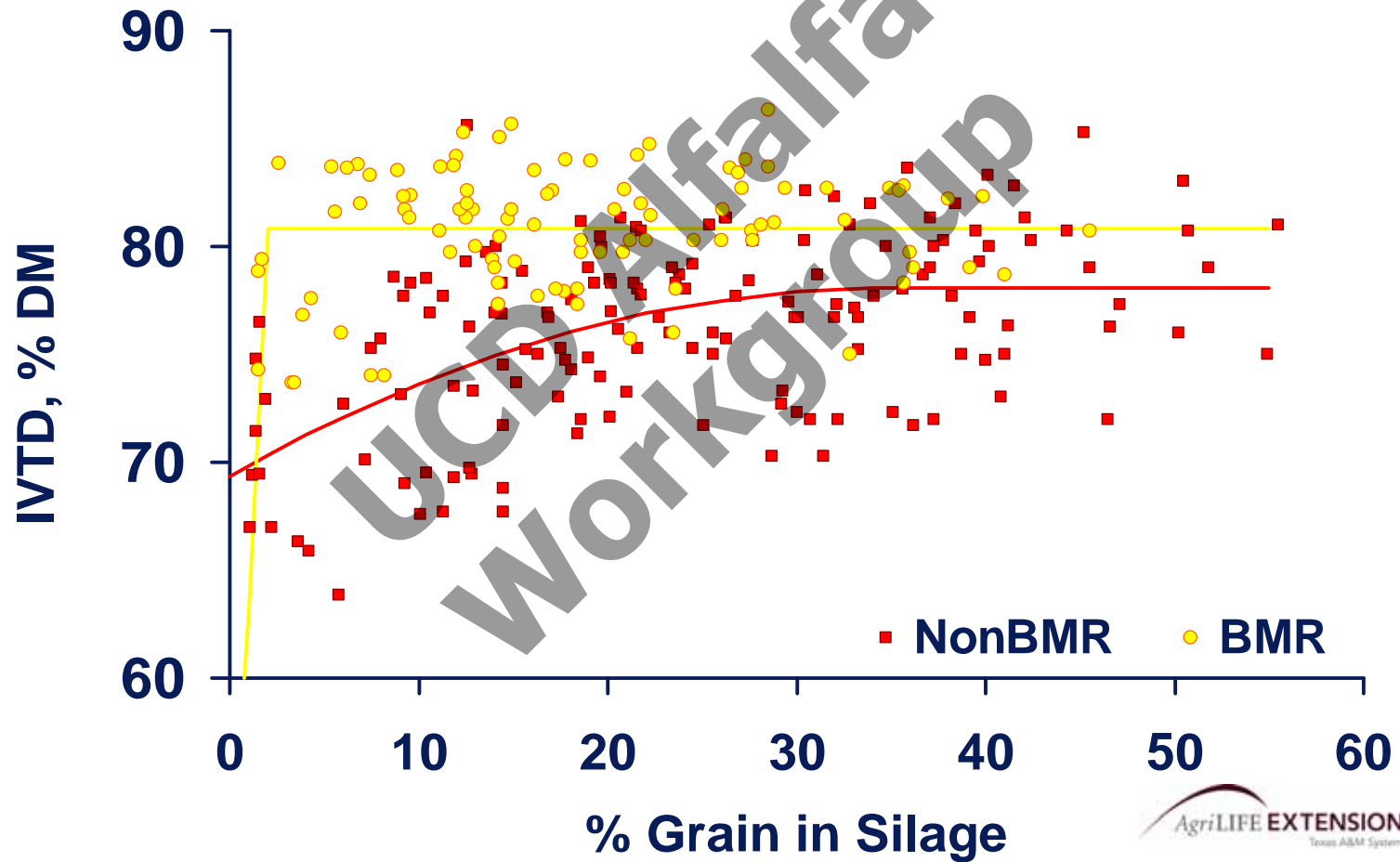
| Type | CP, % | ADF, % | NDF, % | Lignin, % | IVTD, % |
|-----------|------------|--------------|--------------|------------|--------------|
| Corn | 9.0 | 23.9 | 41.2 | 3.5 | 82.7 |
| Range (4) | 8.4 to 9.7 | 18.2 to 27.4 | 33.7 to 45.8 | 2.7 to 4.2 | 78.3 to 88.1 |

| | | | | | |
|-------------------|--------------------|---------------------|---------------------|-------------------|---------------------|
| BMR | 9.2 | 27.6 | 45.9 | 3.6 | 81.3 |
| Range (20) | 6.9 to 10.5 | 24.3 to 35.0 | 40.7 to 60.1 | 2.8 to 4.5 | 75.1 to 84.2 |
| Non-BMR | 8.3 | 29.9 | 49.1 | 4.4 | 75.5 |
| Range (25) | 6.3 to 10.8 | 21.3 to 41.7 | 33.9 to 67.5 | 2.7 to 6.4 | 60.9 to 83.6 |

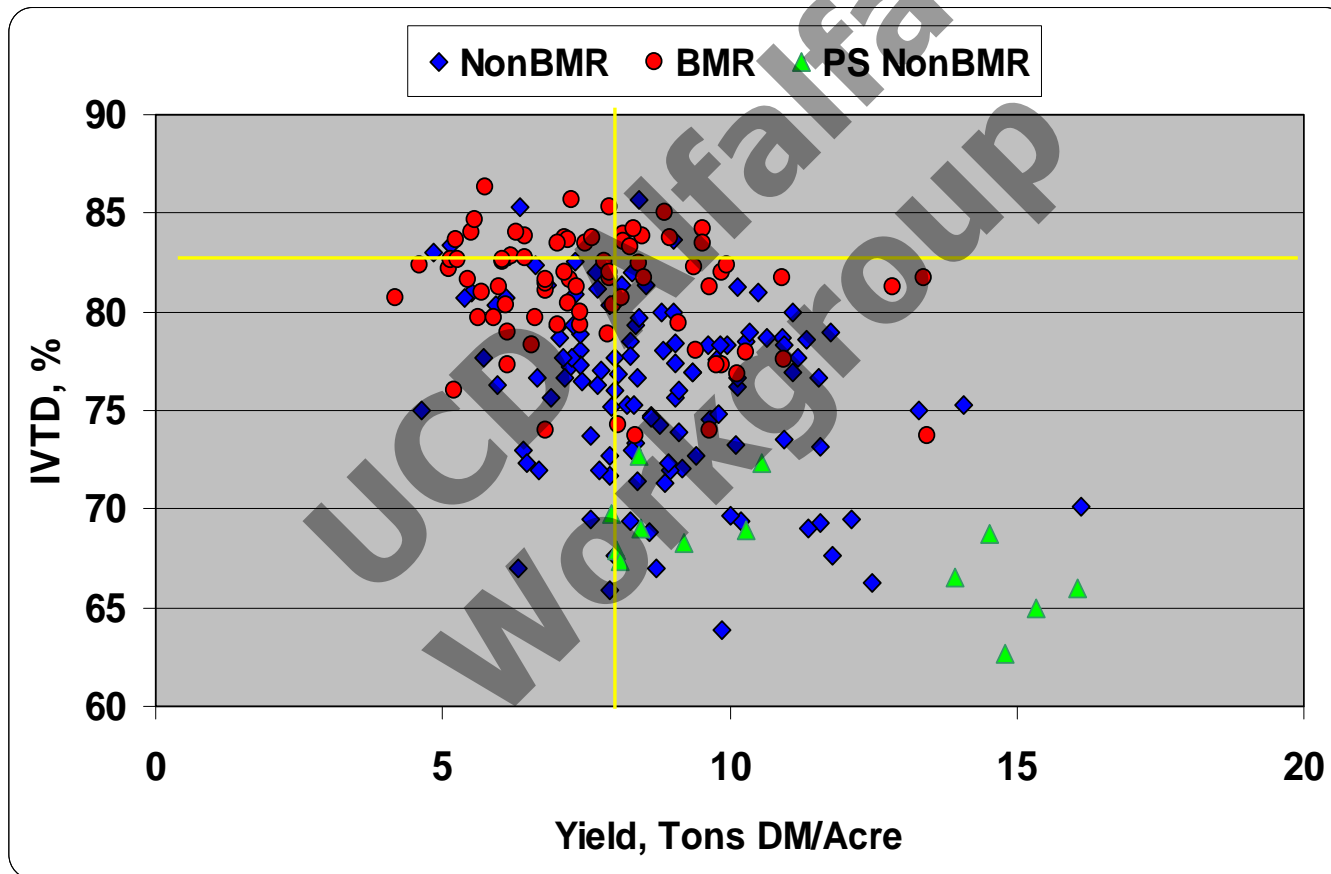
Acid Detergent Fiber and In Vitro True Digestibility



Grain Content and IVTD



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

➤ 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

➤ 2002

- Sorghum, pre + 14.5 inches, **26.9 ton/ac**
- Corn, pre + 24.6 inches, **25 ton/ac**
- Difference: **41%** 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

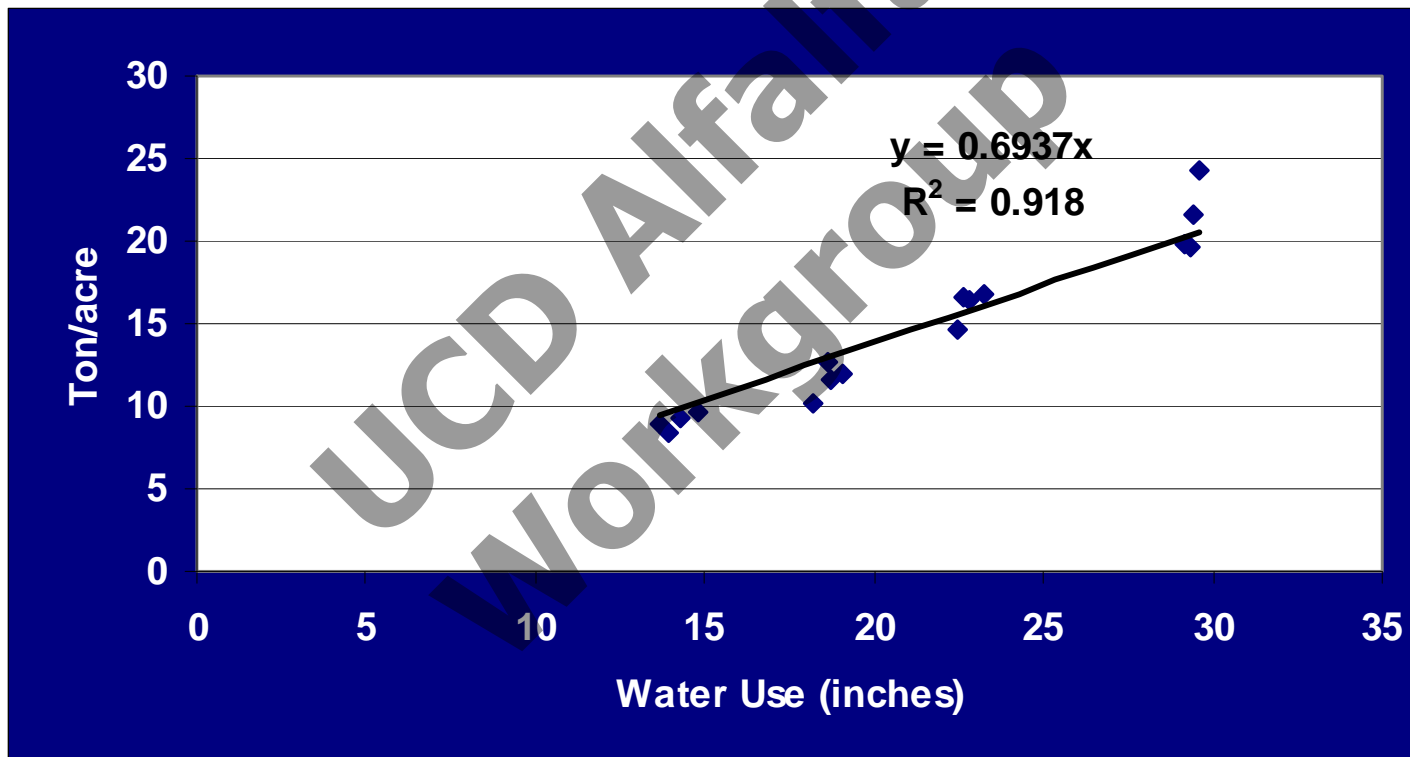
- Two BMR F. Sorghums
- One Non BMR F. Sorghum
- One PS BMR F. Sorghum

– Irrigation Levels

- Dryland
- 4 inches
- 8 inches
- 16 inches



2003 Forage Sorghum Yield per Acre-Inch of Water



**Water use and yield of BMR forage sorghum and corn
Bushland, TX 2007**

Howell. *in* Wetting Front Newsletter. ARS Vol.10, No. 1

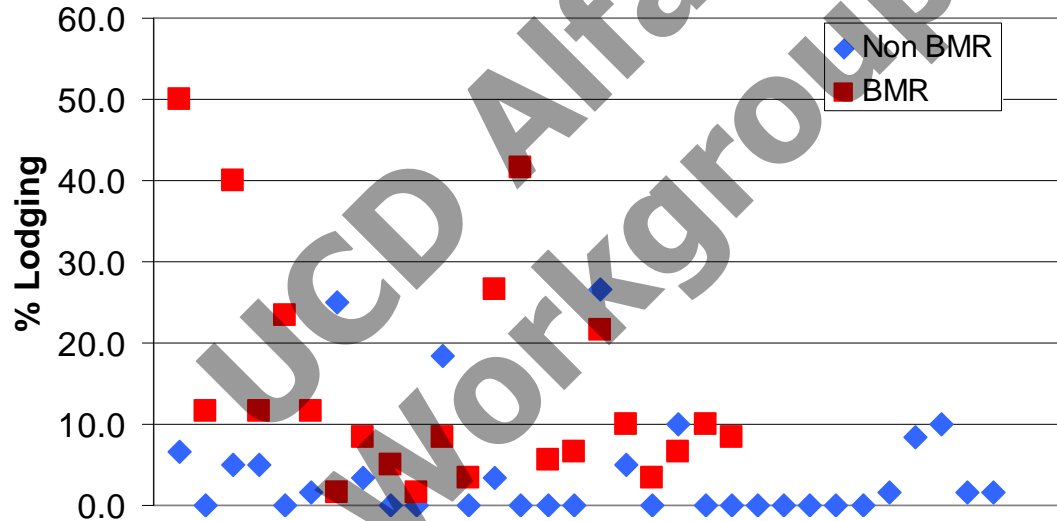
| Species | Yield, ton/Acre @ 66% Moist. | Water Use, ton/ac-inch | Difference in Water Use |
|----------------|---|-----------------------------------|------------------------------------|
| BMR F. Sorghum | 22.7 | 1.17 | 27% Less |
| Corn | 32.7 | 1.24 | |



Percent lodging at harvest (soft-dough stage) of BMR and NonBMR forage sorghum

| Year | BMR Forage Sorghum | NonBMR Forage Sorghum |
|-------------|---------------------------|------------------------------|
| | % lodging (range) | |
| 2001 | 14.6 (0 – 50 %) | 18.7 (0 - 77 %) |
| 2002 | 11.8 (0 – 50 %) | 8.7 (0 – 45 %) |
| 2003 | 14.4 (2 – 50 %) | 4.2 (0 – 27 %) |

Lodging of BMR and NonBMR Forage Sorghum -- 2003



2003 Study

Seeding Rate, N Rate, and Variety Effect on Lodging

Seeding Rates: 30,000, 60,000,
120,000

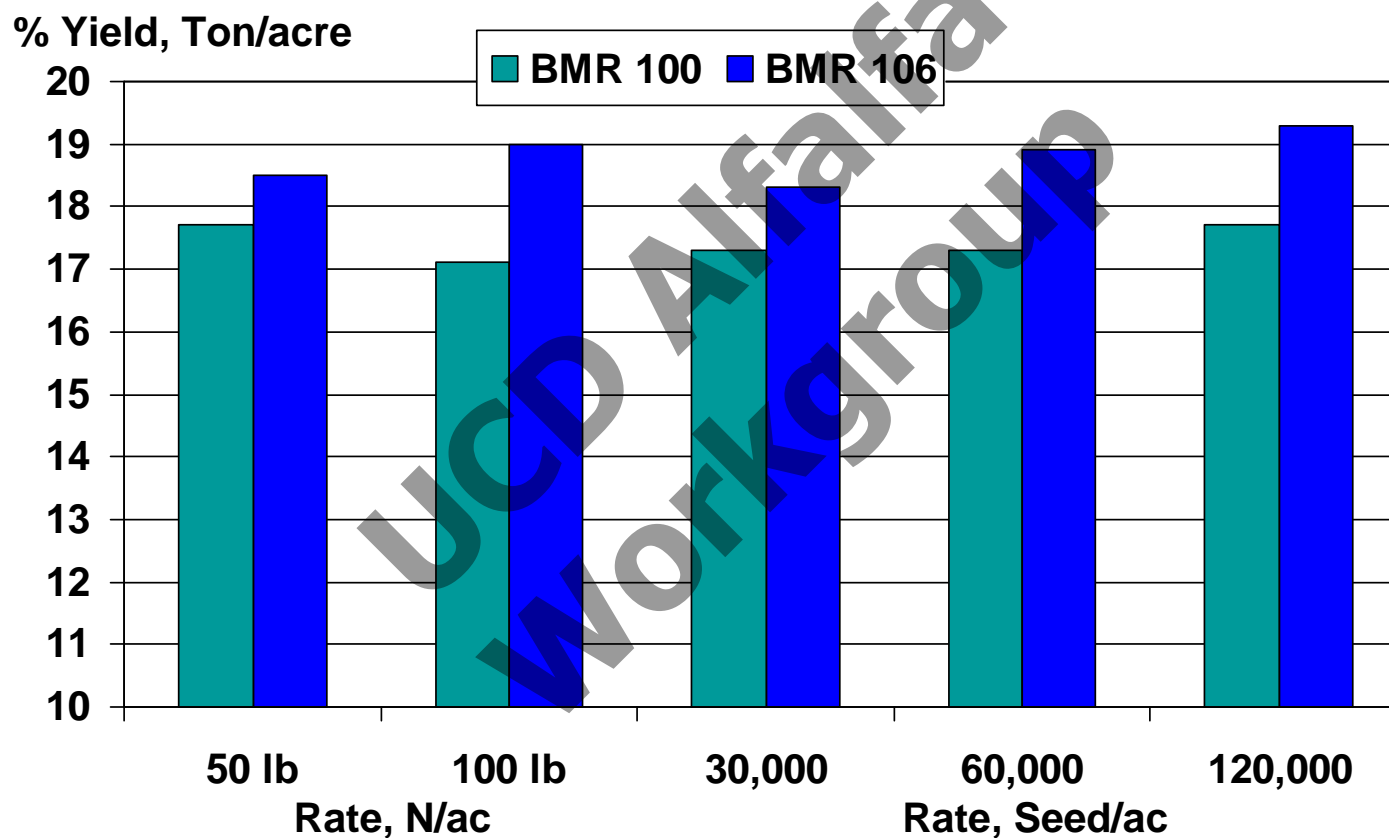
N Rates: 50 lbs, 100 lbs

Varieties: BMR 100, BMR 106

Hybrid, N, and Seeding Rate Effect on Lodging of F. Sorghum - 2003



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



Summary of Six Years of Forage Sorghum Variety Trials

Brent Bean and Ted McCollum^[1]

**Texas Cooperative Extension and Texas Agricultural Experiment
Station**

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**

| | | | |
|---------------------------|-----------------------|-----------------------|---------------------|
| | 2002 | 2003 | 2004 |
| – Variety B yield, ton/Ac | $\frac{20}{22} = .92$ | $\frac{22}{26} = .85$ | $\frac{24}{24} = 1$ |
| – Corn yield, ton/Ac | | | |

Average yield Var. B relative to corn:

$$\frac{.92 + .85 + 1}{3} \times 100 = 92.3\%$$

3

Sorghum Types when Index to Corn 2000 - 2005

| Forage Sorghum Type | Silage Ton/Ac | Crude Protein, % | ADF, % | NDF, % | IVTD, % |
|---------------------|---------------|------------------|--------|--------|---------|
| F. Sorg Conv (27) | 100.0 | 87.8 | 106.6 | 107.0 | 94.2 |
| F. Sorg BMR (17) | 85.9 | 95.6 | 101.0 | 102.3 | 100.4 |
| F. Sorg PS (4) | 119.6 | 75.2 | 143.8 | 142.4 | 85.5 |
| F. Sorg PS BMR (2) | 85.3 | 74.2 | 134.2 | 138.8 | 95.7 |
| G. Sorghum (4) | 80.2 | 103.7 | 90.0 | 90.4 | 100.3 |

Sample of Summary of 00-05 Sorghum Varieties Indexed to Corn

| Num Yrs | Variety | Silage (Ton/Ac) | IVTD, % | Yield, 90% of Corn | % IVTD, 95% of Corn | 10% or Less Lodging |
|---------|------------------|-----------------|---------|--------------------|---------------------|---------------------|
| 6 | 979 | 89.0 | 95.7 | | X | X |
| 6 | 2-Way SRS | 108.1 | 90.3 | X | | |
| 6 | 4 Ever Green | 124.0 | 86.9 | X | | X |
| 6 | 811F | 115.5 | 85.5 | X | | X |
| 6 | A571 (check) | 82.8 | 99.4 | | X | X |
| 6 | Canex BMR 208 | 84.3 | 102.4 | | X | X |
| 6 | Dairy Master BMR | 90.8 | 102.9 | X | X | X |
| 6 | FS-25E | 123.6 | 91.5 | X | | |
| 6 | FS-5 | 106.4 | 95.9 | X | X | X |
| 6 | Maxi Gain | 125.4 | 85.3 | X | | X |
| 6 | Millennium | 90.1 | 104.0 | X | X | X |
| 6 | Nutri-Choice II | 105.6 | 94.2 | X | | |
| 6 | P84G62 (check) | 76.0 | 98.8 | | X | X |
| 6 | RedTop Plus BMR | 84.8 | 100.6 | | X | X |



Any
Questions?

<http://amarillo.tamu.edu>

All program

Agronomy

Forage sorghum

