Forage Sorghum and Silage Corn: Yield, Quality and Water

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Texas AgriLife Research and Extension Service

Study Location

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

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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

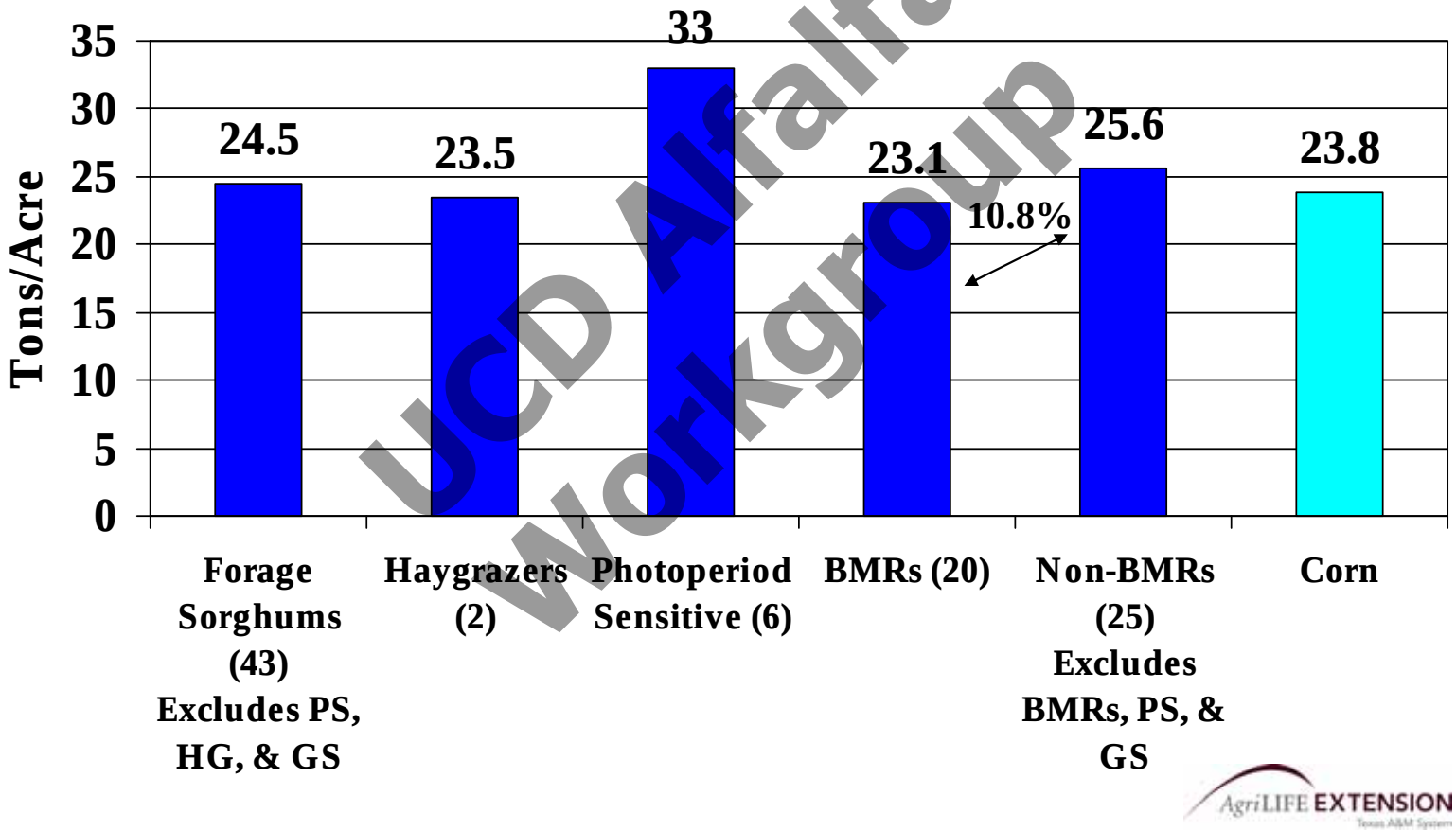
BMR – Brown Midrib Characteristic

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

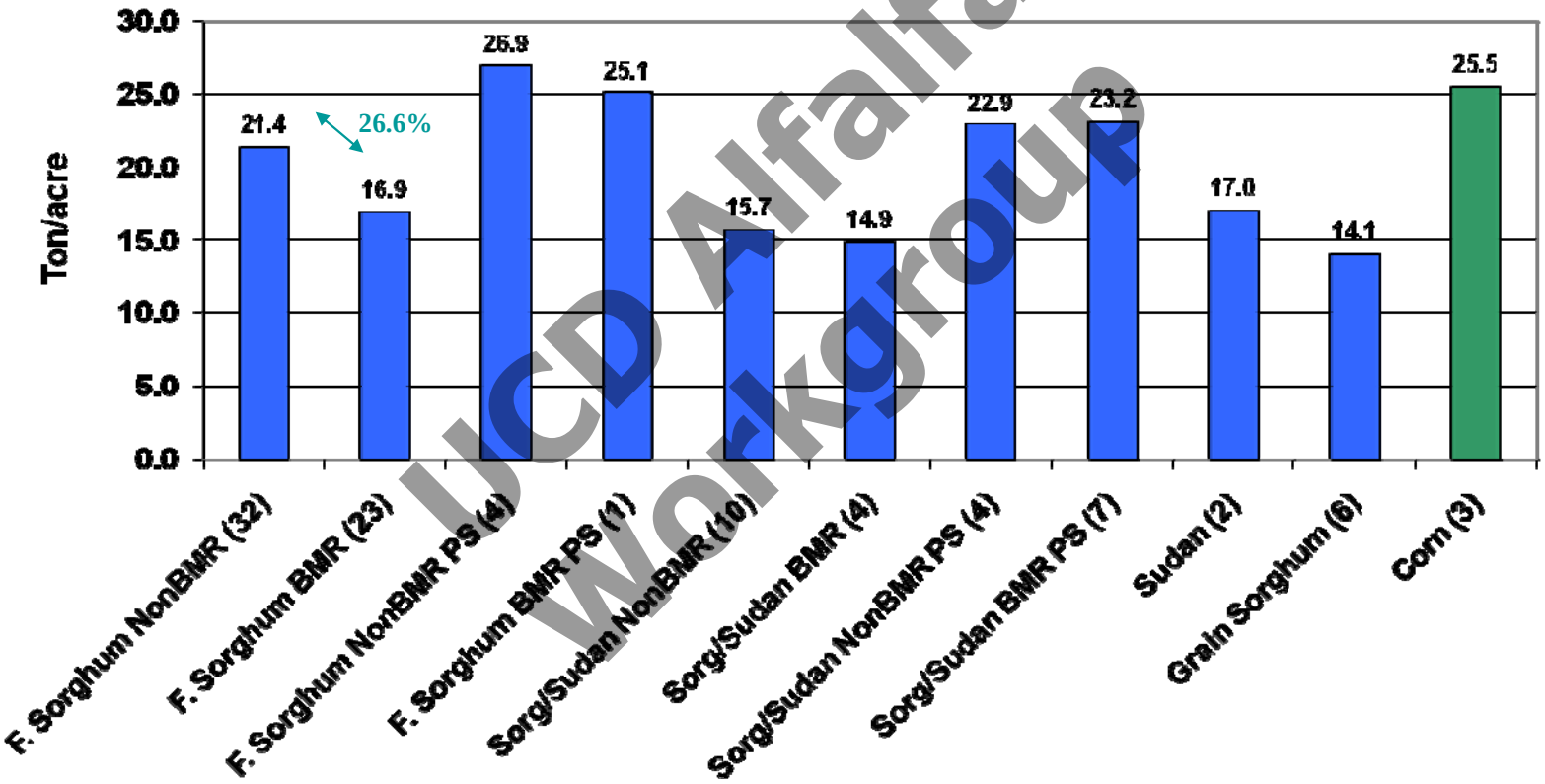
Brown Mid-Rib Sorghums (BMRs)

- 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



Comparison of Sorghum Types for Silage Yield -- 2003

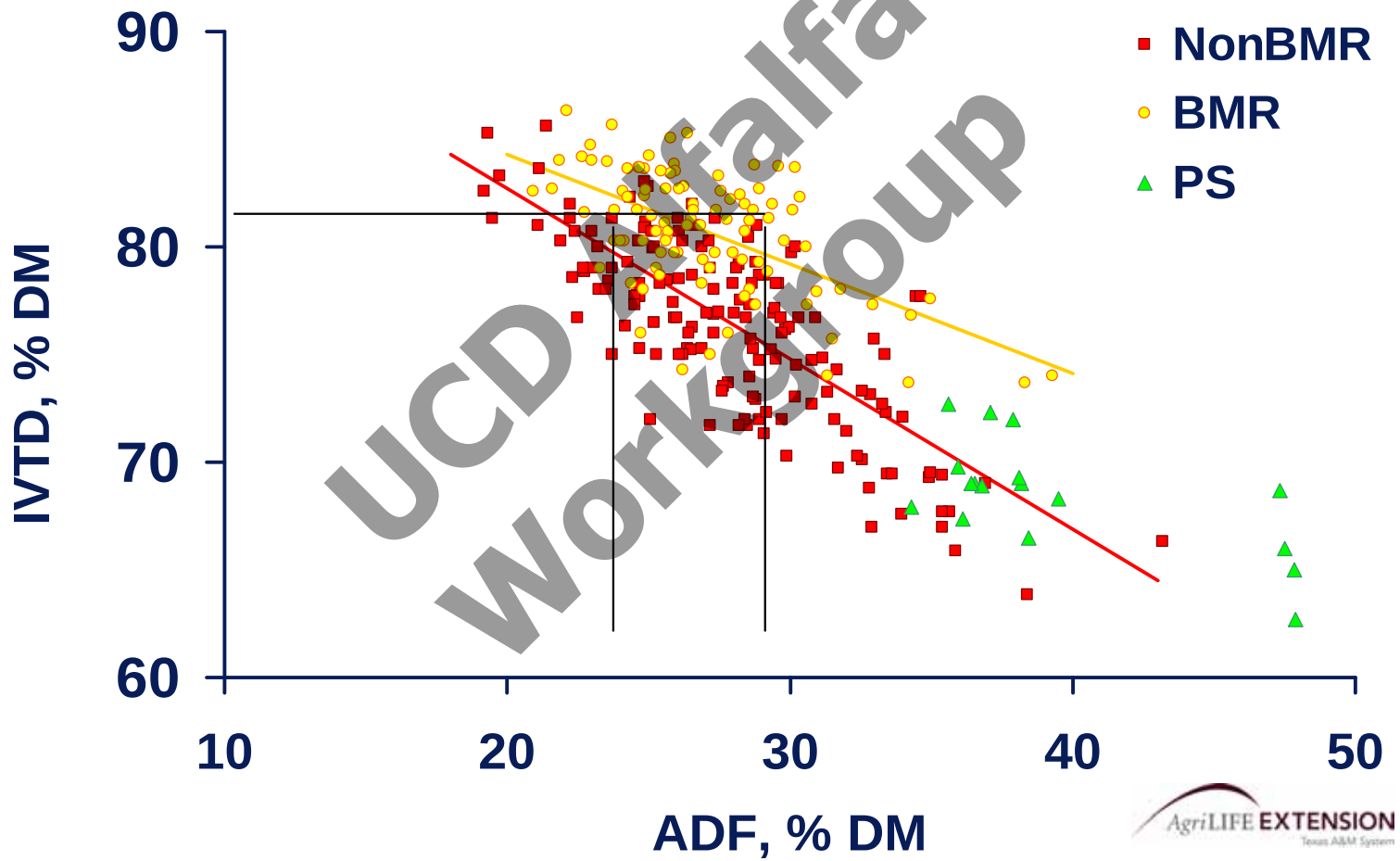


Nutrient analyses – 2001
Bushland

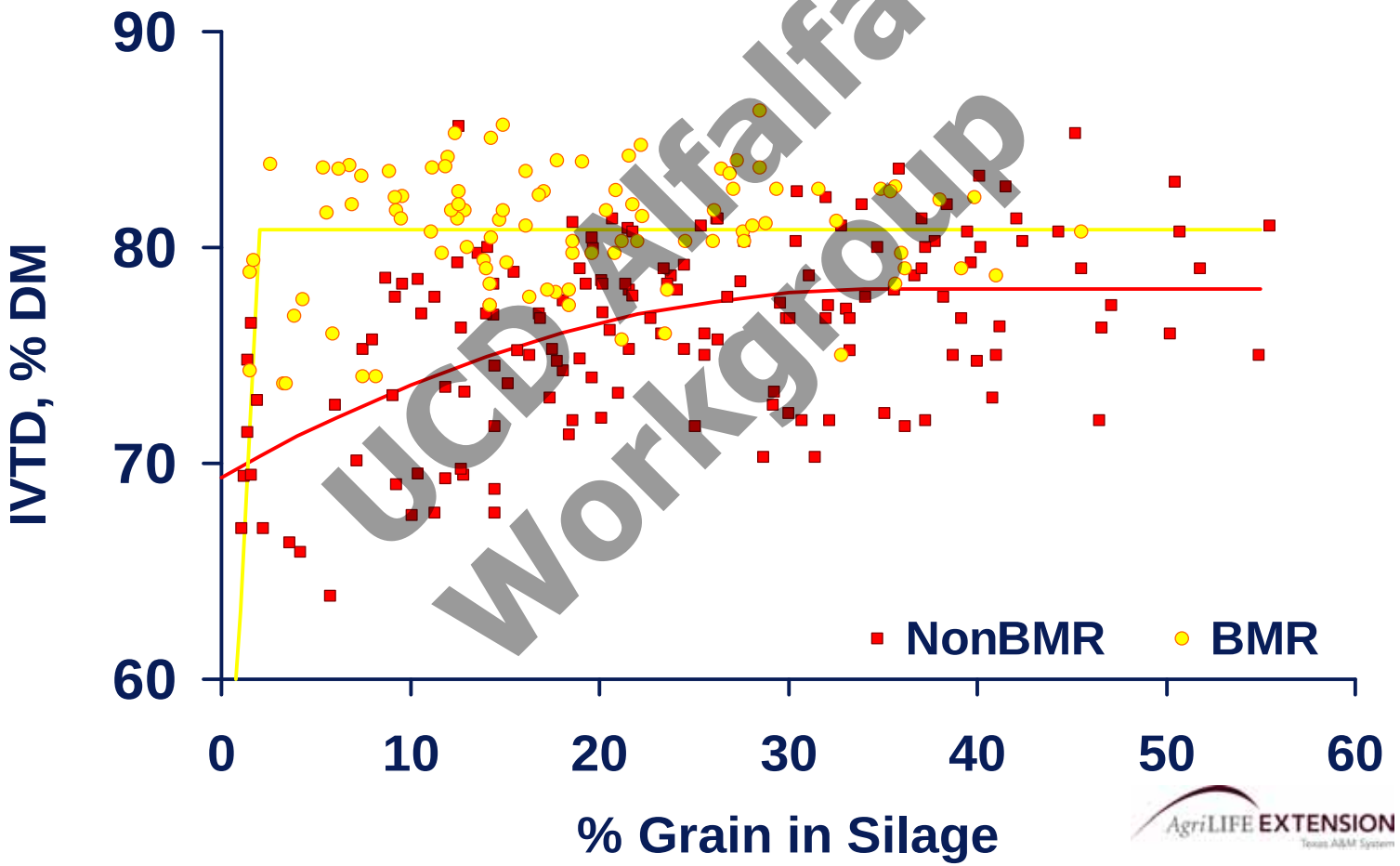
Type	CP, %	ADF, %	NDF, %	Lignin, %	IVTD, %
Corn	9.0	23.9	41.2	3.5	82.7
Range (4)	8.4 to 9.7	18.2 to 27.4	33.7 to 45.8	2.7 to 4.2	78.3 to 88.1

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

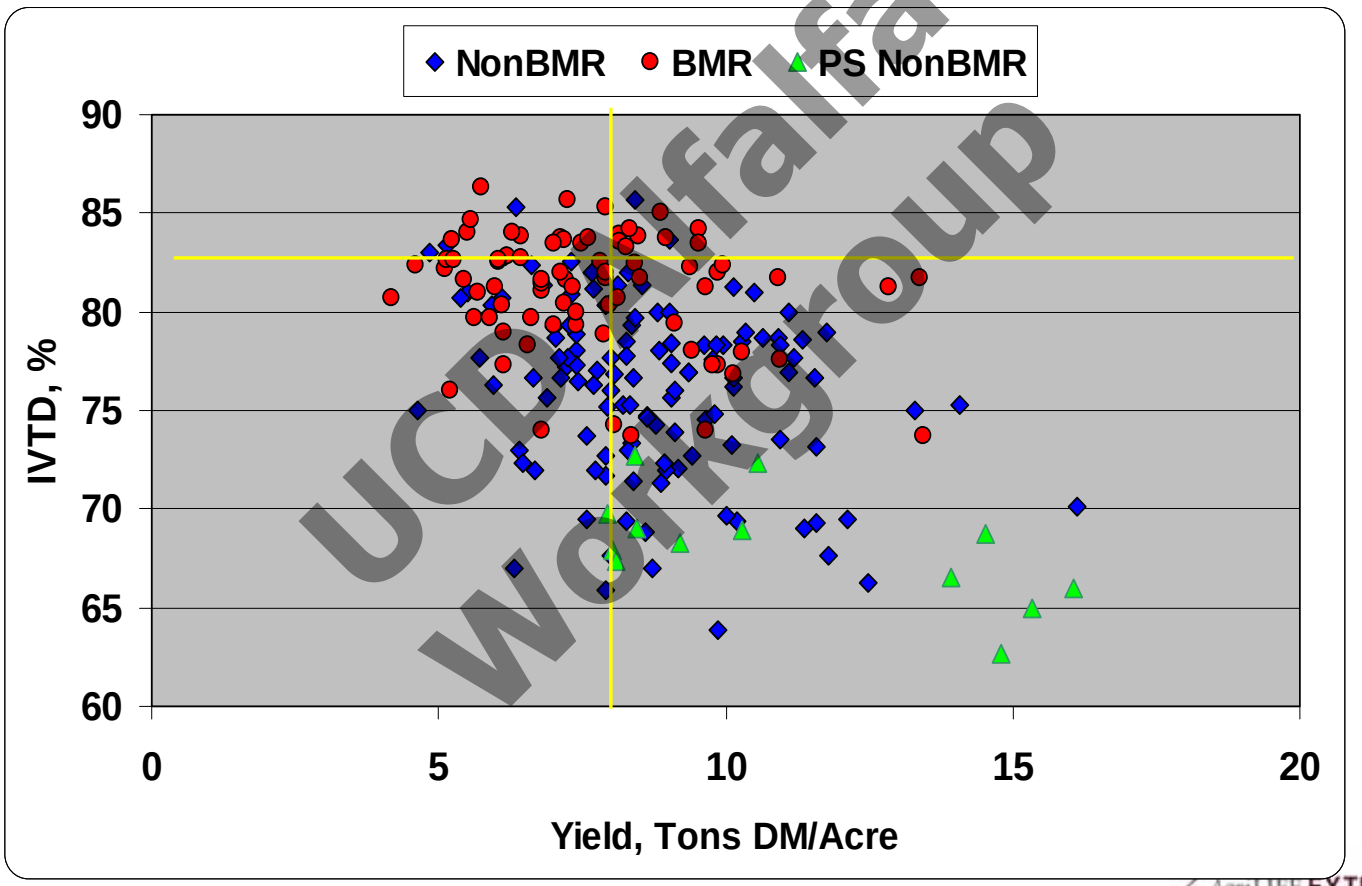
Acid Detergent Fiber and In Vitro True Digestibility



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

➢ 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

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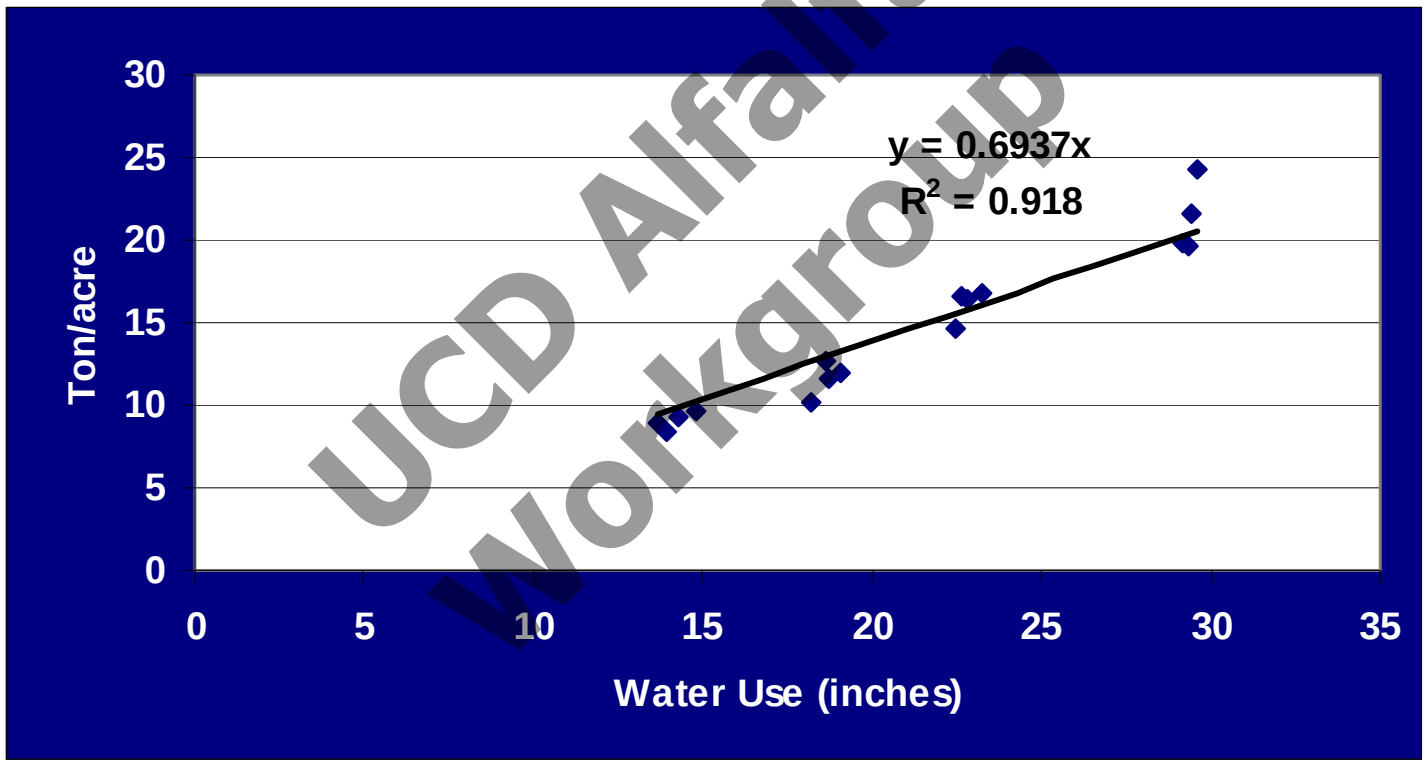
Response of Forage Sorghum Hybrids to Irrigation Amount

- **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



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

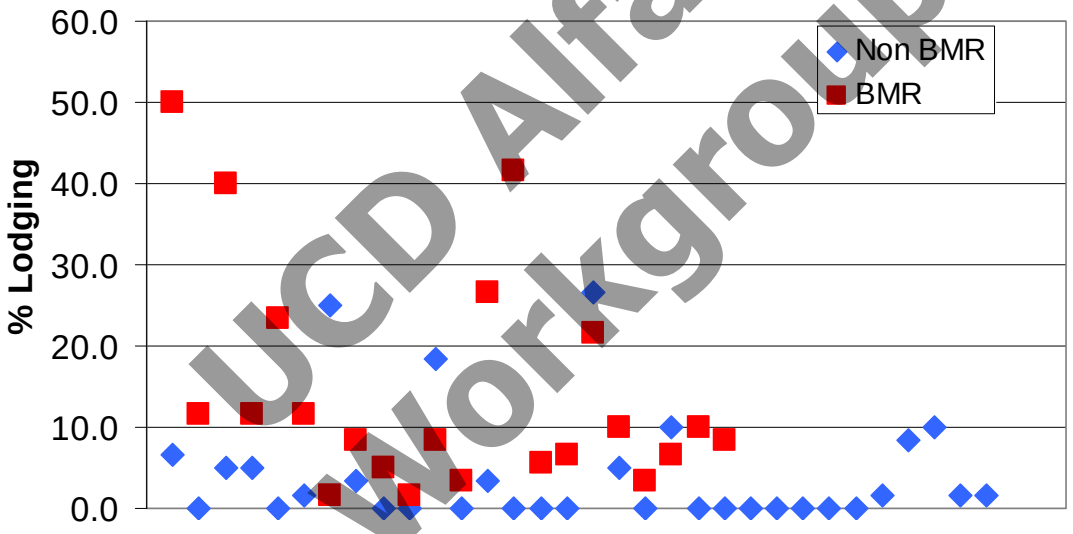
Howell. *in* Wetting Front Newsletter. ARS Vol.10, No. 1

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

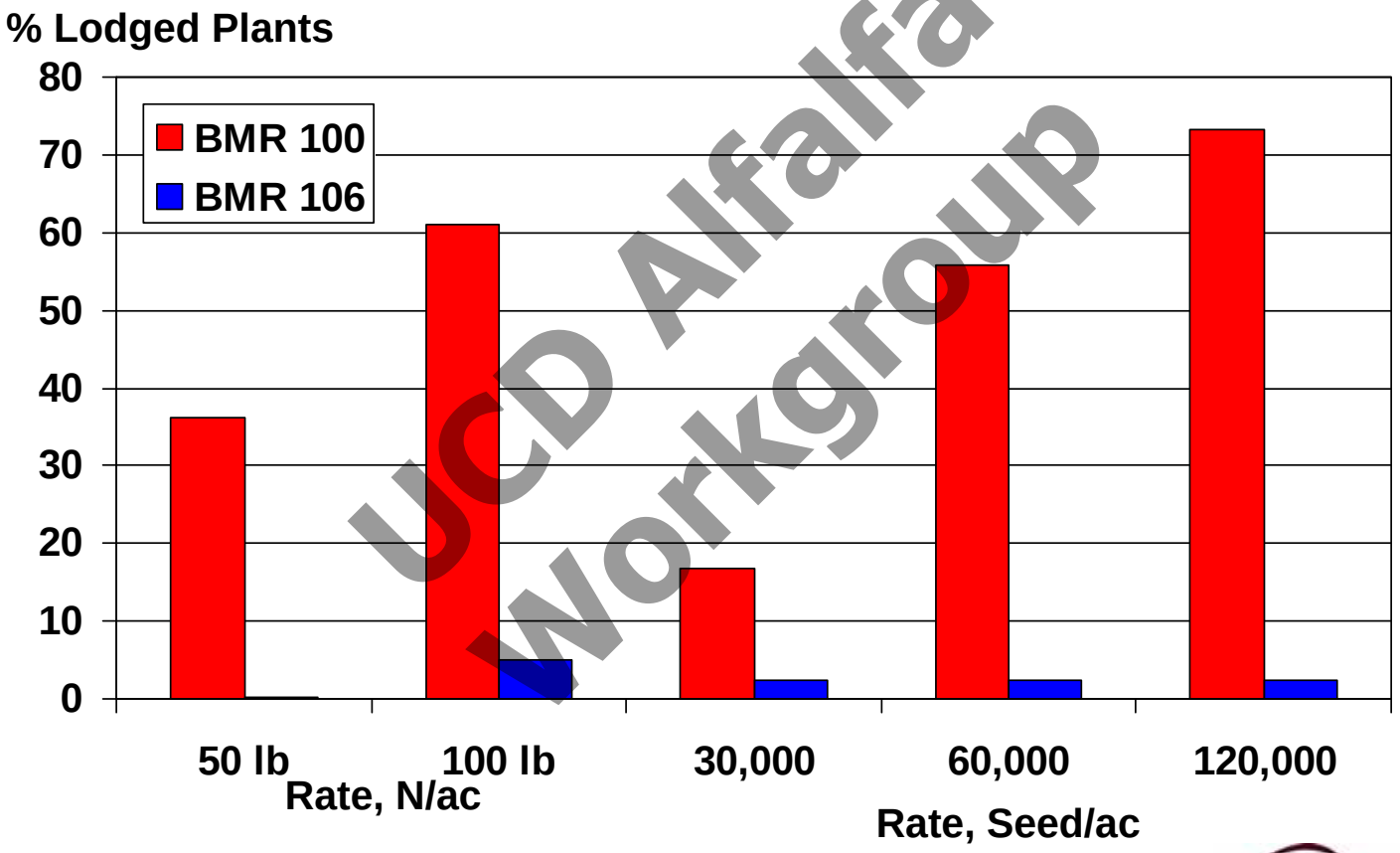
Seeding Rate, N Rate, and Variety Effect on Lodging

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

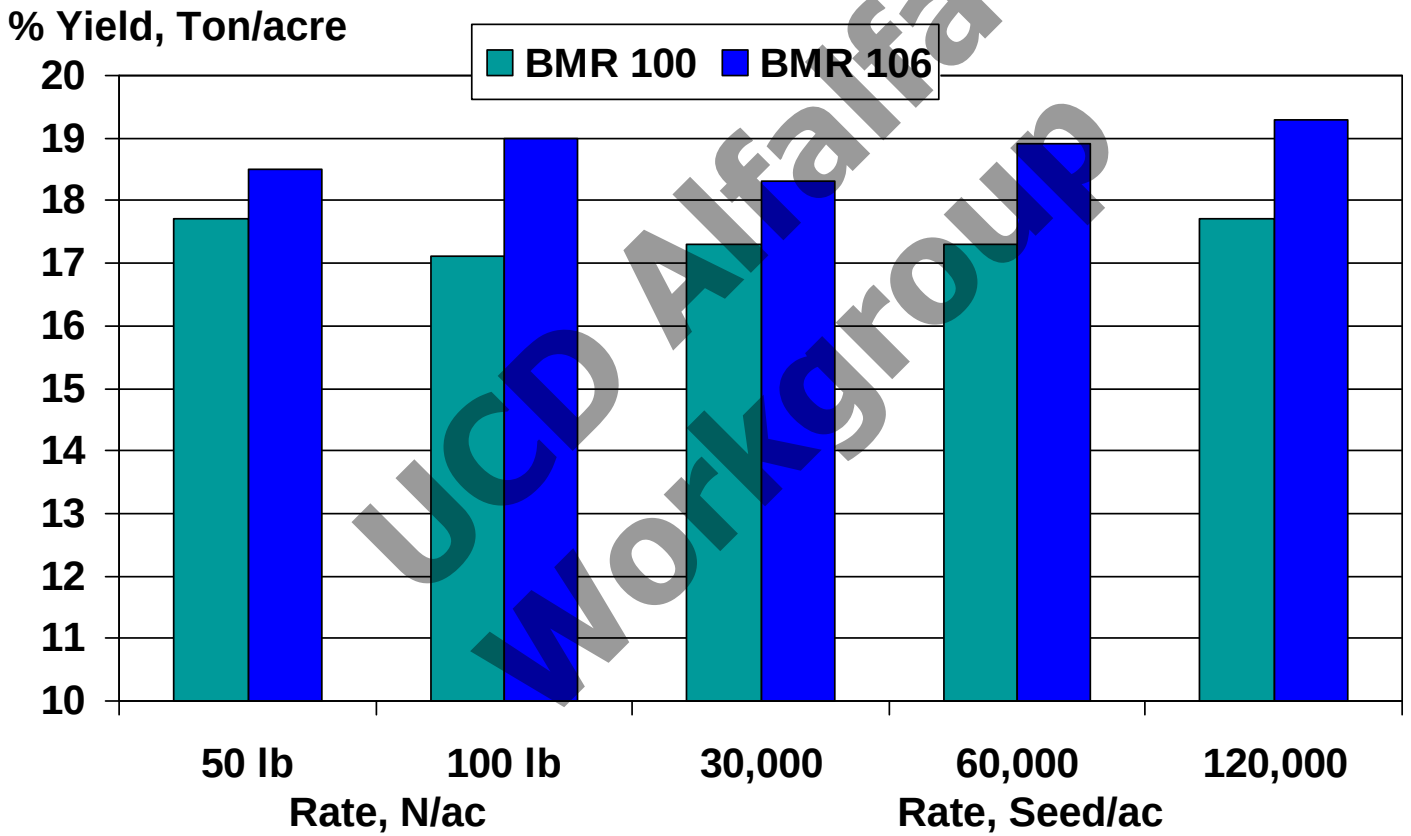
N Rates: 50 lbs, 100 lbs

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	20	22	24
Corn yield, ton/Ac	22 = .92	26 = .85	24 = 1

Average yield Var. B relative to corn:

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

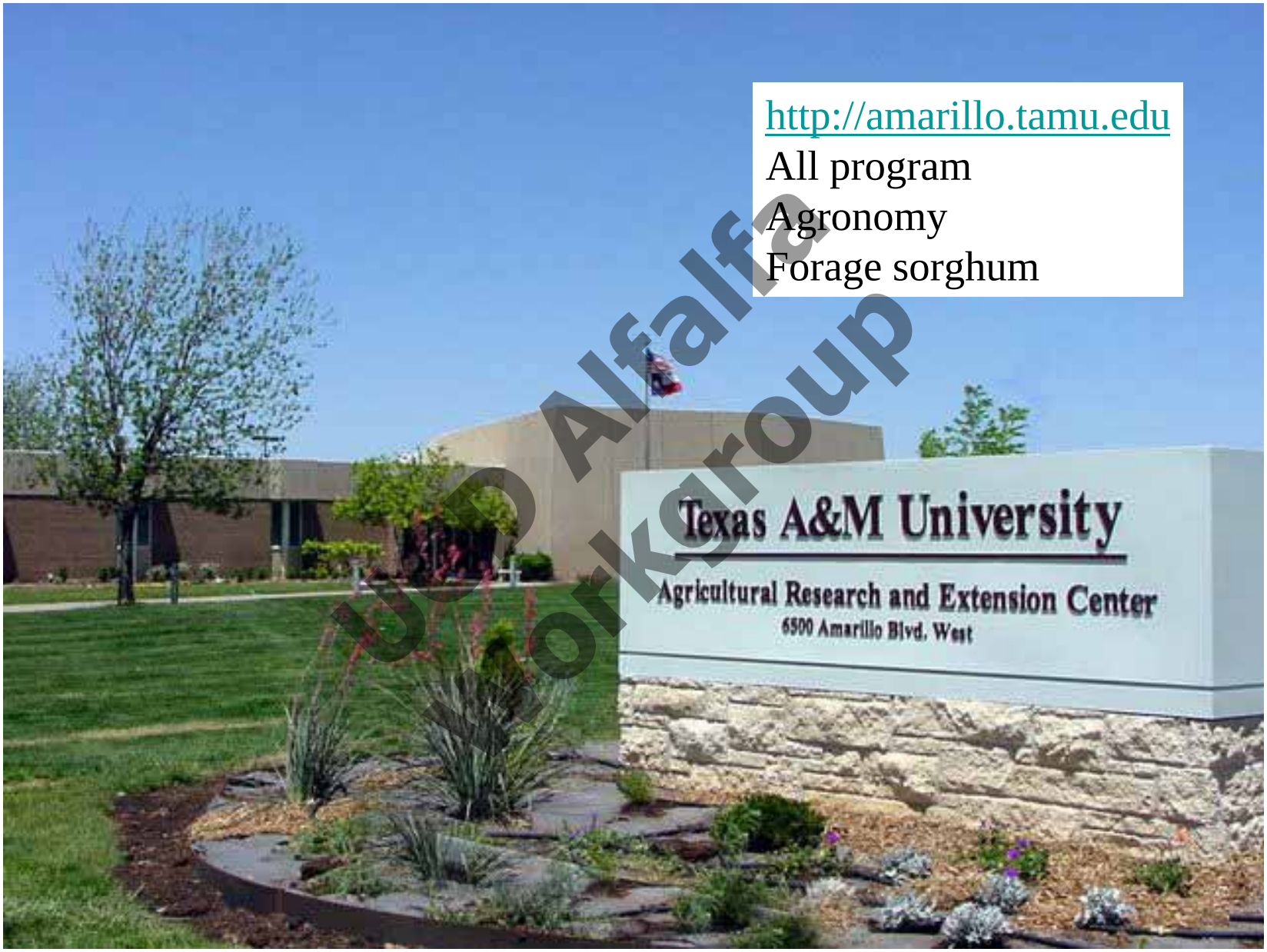
Sorghum Types when Index to Corn
2000 - 2005

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