Producing Quality Forage Sorghum Silage

Brent Bean, Professor and Extension Agronomist
Texas A&M Res. & Ext. Center, Amarillo, TX
b-bean@tamu.edu, 806-677-5600

Introduction

Forage sorghum silage production studies have been conducted since 1999 at the Texas Agricultural Experiment Station, near Bushland, TX. Studies have compared forage sorghum types and varieties for agronomic characteristics, water use efficiency, standibility, forage and grain yield, and nutritional value. Comparisons were also made to corn varieties planted in an adjacent trial. Key production practices in growing quality forage sorghum silage are: 1) variety selection, 2) utilize management practices that minimize lodging, and 3) timely harvest. The key advantage for forage sorghum over corn for silage production is the higher water use efficiency of forage sorghum.

Variety Selection

Forage sorghum types range from sudangrass to traditional grain sorghum. In addition, forage sorghums can be brown midrib (BMR) or photoperiod sensitive (PS). Which type and variety that is best utilized will depend on its end use. For silage production, generally forage sorghums rather than sudangrass or sorghum/sudangrass hybrids are the best choice. Within the forage sorghums both BMR and non-BMR varieties can produce quality silage. BMR sorghums, as the name implies, have a brown midrib. More importantly they have less lignin content in the plant making them, on average, higher in digestibility than non-BMR sorghums. Average in-vitro digestibility (IVTD) of BMR varieties has been higher than non-BMR varieties (Table 1). However, on average, the BMR varieties have yielded 10 to 11 percent less in most years than non-BMR varieties, and in one year where weather conditions were hotter and dryer than normal, yield was 26% less. PS varieties stay in the vegetative stage until day length becomes less than approximately 12 hours and 20 minutes. In the Texas Panhandle environment these varieties consistently produced the highest yield but lowest digestibility. Another problem with the PS varieties has been high moisture at harvest making them unsuitable for silage unless the crop was dried prior to ensiling.

Table 1. Forage sorghum in-vitro digestibility and yield by type (2000-2004).

Characteristic		Non-BMR[1]	BMR	PS	SEM	P value
Yield, tons DM/ac	Mean	8.5[a]	7.5[b]	10.7[c]	0.45	<0.001
	s.d.	1.8	1.8	2.9		
IVTD, % DM	Mean	76.2[a]	80.7[b]	68.5[c]	0. 90	<0.001
	s.d.	4.3	2.3	2.6		

[1]Non-BMR, n = 154 entries; BMR, n = 99 entries; PS, n = 17 entries.

It is important to note that there is a considerable amount of overlap between BMR and non-BMR varieties in respect to yield and digestibility. It would be a mistake to assume that BMR varieties are always superior in digestibility than non-BMR varieties and that thier yield will always be less. When choosing a variety it is important to examine a

particular variety's characteristics rather than assuming anything based on it being a BMR or non-BMR variety.

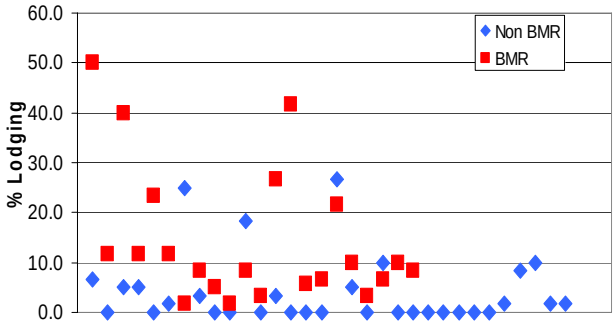

Figure 1. Lodging of non-BMR and BMR varieties in 2003.

Minimizing Lodging

Lodging on average has not been worse with the BMR varieties. However, a higher percentage of the BMR varieties tend to have at least some observable lodging compared to the non-BMRs (Figure 1). Lodging can be minimized by variety choice, not over fertilizing with nitrogen, and planting a lower seeding rate. In 2003, two BMR varieties were planted at three seeding rates (30,000, 60,000, and 120,000 seed/acre) and fertilized at two N rates (50 and 100 lbs/acre) (Figure 2). The BMR 106 variety had very little lodging regardless of N or seeding rate. However, lodging of BMR 100 was greatly increased at the higher N and higher seeding rates. If a variety is being grown that has a tendency to lodge, N fertilizer rate should be carefully monitored. The recommendation for N fertilization is 8 to 9 lbs of N per ton of expected yield (at 65% moisture). Be sure and subtract from the fertilizer recommendation any residual N that is in the soil. Seeding rate had a very large influence on lodging. As seeding rate increased, so did lodging. Lower the seeding rate will clearly help if lodging is an anticipated problem. Results suggest that lowering seeding rate, to 60,000 - 80,000 seed/acre, will normally not reduce yield and significantly reducing lodging under most conditions.

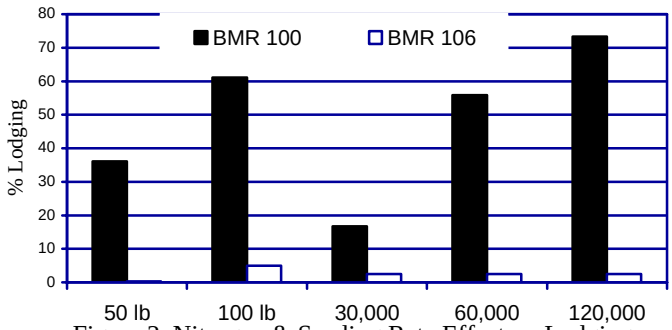

Figure 2. Nitrogen & Seeding Rate Effect on Lodging of BMR 100 and BMR 106 Forage Sorghum Varieties.

Timely Harvest

Harvesting forage sorghum at the correct stage is essential in producing quality silage and to minimize lodging. Ideally forage sorghum should be harvested when the whole plant moisture content is between 63 and 68%. With grain producing forage sorghums the correct moisture content is generally reached when the grain has reached the soft dough stage.

Water Use Efficiency

Forage sorghum silage yields have been similar to those of corn while using 30 to 40% less irrigation water. In trials conducted in 2003 and 2004, sorghum silage yield increased approximately 0.75 ton/acre (at 65% moisture) for every inch of watered used by the crop. This included water stored in the soil, rainfall, and irrigation.