Texas Dairy Matters

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BMR, Non-BMR and Male-Sterile Sorghum: Is the nutritional value different?

Douglas Duhatschek, DVM, and Juan Piñeiro, DVM, MSc, Ph.D.
Department of Animal Science, Texas A&M AgriLife Extension Service,
The Texas A&M University System

Introduction

Reduced well capacity is a growing threat to forage production to feed cattle in the U.S. southern High Plains. The intensity of droughts impairs forage production in irrigated lands that do not have sufficient irrigation capacity. Further, droughts also affect dryland crop yield and the recharging rate of the aquifer. Growing water-efficient crops is a wise option to reduce forage scarcity risks in these types of environments. Most forage sorghum hybrids need less water than corn; however, when it comes to feeding lactating dairy cows, the nutritional value is what raises concerns.

Historically, forage sorghum has been shown to produce less starch than corn. Moreover, the starch in whole plant forage sorghum silage is less digestible when compared to the starch in corn silage. To achieve greater starch digestibility, the berries need to be processed[1] to expose the starch to ruminal microbes. However, processing berries at harvesting whole plant sorghum silage is difficult, as shown in previous publications[2]. Fiber digestibility of non-BMR sorghum hybrids is lower than conventional corn silage, however most brown mid-rib (BMR) forage sorghum hybrids are an exception to that rule. In addition, male-sterile hybrids have the capacity to store high sugar content that could partially replace the energy loss due to low starch concentration.

BMR and Non-BMR

Pupo and collaborators (2022)[3] evaluated 11 years of trial data in Florida (2008-2019) and reported that the neutral detergent fiber (NDF) digestibility at 30h of BMR forage sorghum hybrids to be approximately 6 percentage points higher than the non-BMR in spring – 52.1% and 45.8%, respectively, and 4 percentage points in summer 49.7% and 46%, respectively. In addition, the predicted dry matter intake (DMI) was 0.4 lb. greater for BMR versus non-BMR sorghum silage.

Similar results on NDF digestibility have been published from trials conducted in the Texas panhandle by Dr. Jourdan Bell and collaborators[4]. Table 1 summarizes data from 2018 until 2021. Noticeably, BMR sorghum hybrids have on average 0.6 percentage points less lignin than non-BMRs, which might partially explain the 4.6 percentage points increase in NDF digestibility of the former. However, there is high variation between these hybrids and not every single BMR sorghum hybrid will be superior to non-BMR sorghum hybrids regarding fiber digestibility. Therefore, farmers should seek data from sorghum forage trials before deciding which hybrid to use.

Table 1. BMR (n=121) and non-BMR (n=147) forage sorghum and sorghum-sudangrass hybrids nutritional value summary of data from trials from 2018 to 2021 at Bushland, Texas[4].

Trait	*BMR*	*non-BMR*	*%-points difference*
NDFD48, % NDF	55.9 (6.3)	51.3 (7.4)	4.6
Lignin	2.71 (0.94)	3.35 (0.88)	-0.64

Forage sorghum (n=177) and sorghum-sudangrass (n=91) are combined.
Values presented are **Mean (SD)**.

When comparing BMR sorghum silage to conventional corn silage, a meta-analysis published in 2019[5] reported that NDF digestibility did not differ significantly. Thus, fiber digestibility of most BMR sorghum hybrids can be as good as conventional corn hybrids. The challenge is how to bring back the energy loss, mostly due to starch loss, in rations after replacing corn silage with BMR sorghum silage with lower starch concentration.

Male-Sterile Sorghum

Male-sterile sorghum hybrids do not develop grain and, with less weight in the panicle, lodging concerns are reduced. Also, the harvesting window is more flexible because there is no need to harvest the material at soft dough. In fact, Thomas Kilcer[6] in upstate New York has shown that if you wait six weeks after boot stage to harvest a sterile hybrid, this material will greatly increase in sugars from roughly 4% to 18.8%. Preliminary data from a trial we conducted in 2022 indicates that similar results can be achieved in Texas (Table 2). Water soluble carbohydrates (WSC) are non-structural carbohydrates, just like starch. WSC has a higher rate of digestibility compared to starch. Despite its higher digestibility rate, Martel and collaborators[7] reported an increase in ruminal pH when feeding a diet partially replacing corn starch with sugar. Thus, WSC may represent a lower risk for the development of ruminal acidosis when compared to starch. The high content of sugar found in these male-sterile hybrids show a big opportunity to produce water-efficient forage, with high-digestible fiber and with a good energy content.

Table 2. Nutrient composition of freshly chopped Male Sterile BMR Sorghum.

TRAIT	**DM, %**	**STARCH**	**WSC**	**aNDF**	**LIGNIN**	**TNDFD30**
BMR, MEAN	26	8	20	45	3.73	49
BMR, CV	3%	6%	6%	1%	7%	5%

References

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