Texas Dairy Matters

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Strategies to include sorghum silage in lactating cows rations. Part 2

Juan M. Piñeiro, DVM, MS, Ph.D., Douglas Duhatschek, DVM, Artur Grando Pilati, DVM
Department of Animal Science, The Texas A&M University System
Guest author: Lyndon Luckasson, OEM Business Director, Scherer Inc.

Introduction

The expansion of milk processing capacity and dairy cows in Texas is increasing forage demand amid ongoing water scarcity concerns. While corn is the primary silage crop, sorghum offers drought resistance at lower input costs. However, the current challenges with conventional sorghum silage are lower fiber and starch digestibility compared to conventional corn silage. Strategies to increase sorghum fiber digestibility have been discussed in a previous article and include using brown midrib (BMR) hybrids that have been shown to have similar fiber digestibility to conventional corn silage[1]. This article will focus on the use of grain processing technologies to increase berry processing and starch digestibility of sorghum silage[2,3].

Figure 1. Forage sorghum harvested without the use of kernel processors (KP; left, 85% of intact berries) and with KP (right, 2% of intact berries and 98% of processed berries).

Strategy No. 2. Focus on yield and starch digestibility

To decide which sorghum hybrid to use, farmers need to set their priorities while considering land availability, water well capacity and access to cutting-edge harvesting technologies. If the priority is to obtain high yield and starch digestibility from forage sorghum, then cutting-edge grain processing technologies are needed to process >95% of sorghum berries, especially if harvesting hard dough stage. Berry processing improves starch digestibility by breaking the pericarp and starch-protein matrix and increasing surface area for digestion[3].

In collaboration with Scherer Inc.'s team, we randomly collected samples from three different areas of a forage sorghum field harvested at the hard dough stage. Kernel processors (KP) and harvesting settings, that may be available on the market in the future, designed to maximize the processing of sorghum berries were used. The ongoing experiment consists of two different ensiling times and three different harvesting settings:

1- Low cut height (~8 in) without kernel processors (KP).
2- Low cut height (~8 in) with KP.
3- High cut height (~48 in) with KP.

We recently sent samples to determine nutrient composition, berry processing score (BPS) and rumen in-situ starch digestibility. Some promising preliminary results suggest this method of berry processing may increase starch digestibility (Fig. 1). We hypothesized the use of KP would increase BPS and rumen starch digestibility and also that increasing the cut height would further increase BPS and rumen in-situ starch digestibility.

We used the 2013 Penn State Particle Separator box, consisting of three consecutive sieves with gradually smaller pores sizes (0.75, 0.31 and 0.16 in) and a Bottom Pan to collect all the sieved material, to assess all treatments (Fig. 2). Compared to Low cut height without KP, the treatment Low cut height with KP triplicated the amount of material passing through all sieves (7% vs. 21%, Fig. 3) and had less intact berries (1.6% vs 85%, Fig. 1).

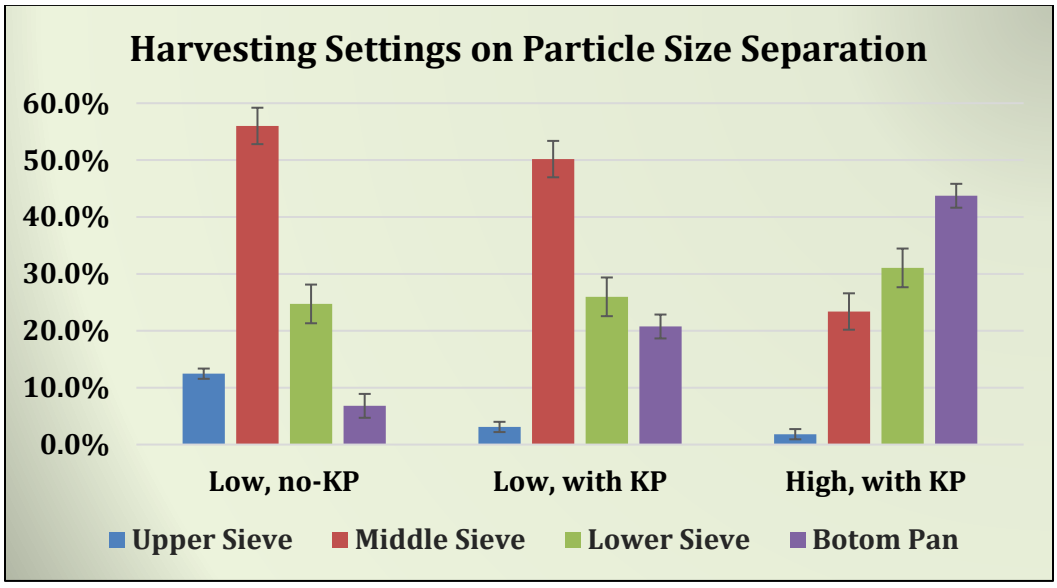

Figure 2. Mean (±SEM) particle size separation of sorghum silage by harvesting settings. Low, no-kernel processors (KP): low-cut height (~8 in) without KP; Low, with KP: low-cut height with KP; and High, with KP: high-cut height (~48 in) with KP.

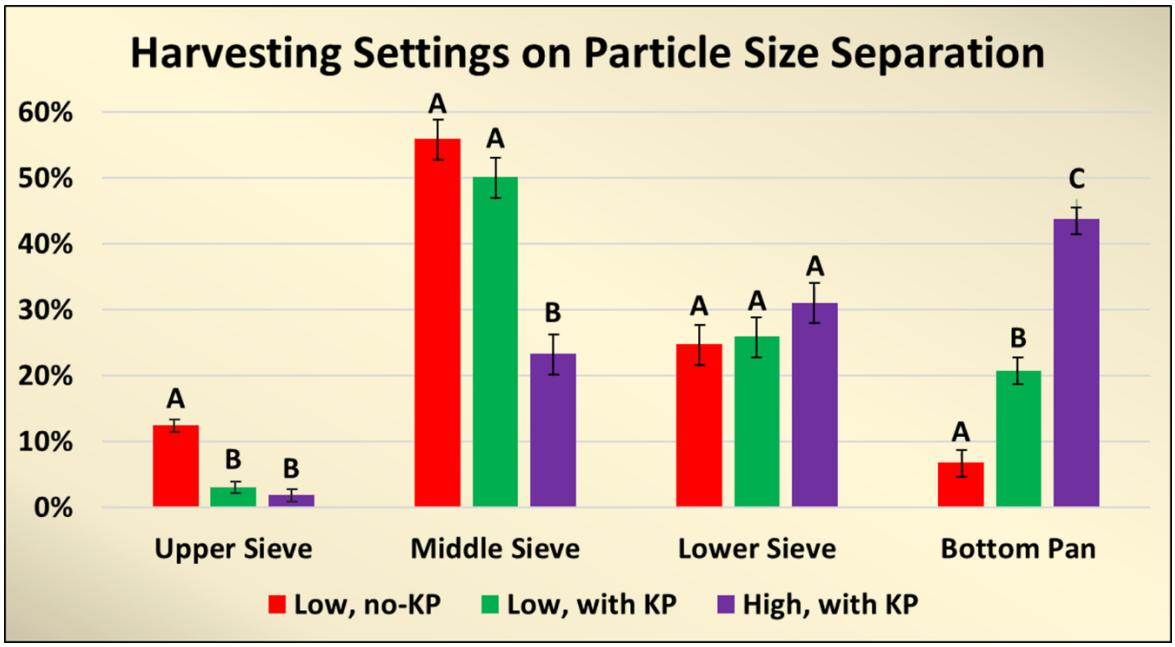

Figure 3. Mean (±SEM) particle size separation of whole-plant sorghum silage harvested with three different settings by Pen State Particle Separator. Low, no-kernel processors (KP): low-cut height (~8 in) without KP; Low, with KP: low-cut height with KP; and High, with KP: high cut height (~48 in) with KP. Means with different superscript within the same sieves are significantly different. Compared to Low no-KP, Low with KP triplicated the amount of material passing through all sieves.

While the treatment High cut with KP had the highest content of material passing through all sieves and 0% intact berries, it also leaves a significant amount of forage (biomass) in the field and may drastically reduce the fiber content in the silage. Compared with the Low cut with KP treatment, the High cut with KP reduced by more than half the content in the middle sieve.

A survey from U.S. livestock operations with 53 ensiled sorghum samples estimated the mean BPS to be 20% and 10.6% of the starch passing through 0.093 inches and 0.067 inches sieves. Furthermore, authors from this study suggested using the 85th percentile for BPS as an initial goal which corresponds to 28.4% and 17% of the starch passing through 0.093 inches and 0.067 inches sieves[4]. While we still must wait to obtain the BPS laboratory results, we strongly believe that these cutting-edge berry processing technologies will be way above these initial goals. Stay tuned for more updates on this research project.

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References

[1] Sánchez-Duarte, J. I., K.F. Kalscheur, A.D. Garcia, and F.E. Contreras-Govea. 2019. Short communication: Meta-analysis of dairy cows fed conventional sorghum or corn silages compared with brown midrib sorghum silage. J. Dairy Sci. 102:419–425.

[2] McCary C.L., and L.F. Ferraretto. 2020. Re-evaluating berry processing score. Hay and Forage grower.

[3] McCary C.L., 2019. Strategies to improve whole-plant sorghum silage nutritive value. Master of Science Thesis, University of Florida.

[4] Raver K., J. Goeser, S. Marshall. 2023. A survey of berry processing score and nutrient content of sorghum silage on commercial livestock operations across the US. J. Anim. Sci.