Texas Dairy Matters

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Strategies to include sorghum silage in lactating cow rations. Part 3.

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Introduction

The expansion of dairy cattle inventory in the Texas Panhandle is increasing forage demand while groundwater levels decline. Sorghum is a drought-tolerant forage alternative with low input costs, and production of sorghum for silage has increased in recent years in the U.S. and Texas (Fig. 1)[1]. However, conventional sorghum silage has lower fiber and starch digestibility compared to corn. In a previous article, we shared preliminary results of a new grain processing technology that significantly increases berry processing[2]. This article will share the berry processing score and starch digestibility of sorghum silage from the same experiment.

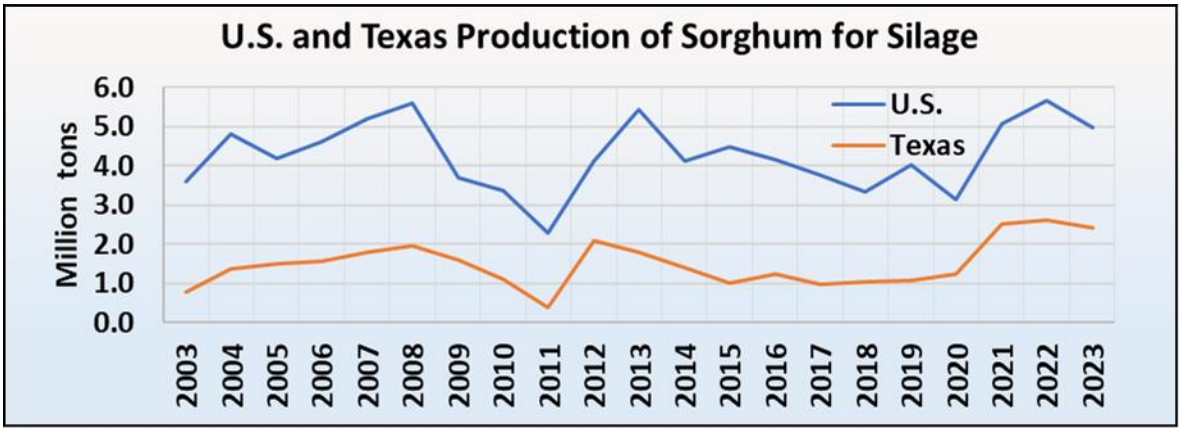

Figure 1. Production of sorghum for silage in the U.S. and Texas. From 2020 to 2023, production of sorghum silage increased by 59% in the U.S. and 92% in Texas. Data from USDA-NASS. 2004-2024.

A new processing technology may be a game changer for sorghum silage

In collaboration with Scherer Inc., we randomly collected duplicated samples from three different areas of a field with a forage sorghum hybrid (Pearl, MOJO seeds, Hereford, Texas) under center pivot irrigation harvested at the hard dough stage[3]. The objectives were to assess the effect of a novel kernel processing, KP, technology and ensiling time on sorghum silage processing and rumen in situ starch digestibility after seven hours of incubation. The experiment consisted of two different ensiling times -- 0 or 90 days -- and three different harvesting strategies:

1- Low noKP: Low cut height (8 in) without KP.
2- Low +KP: Low cut height (8 in) with KP.
3- High +KP: High cut height (48 in) with KP.

Compared to Low noKP, using KP significantly increases the berry processing score, BPS, (percentage of starch passing a 1.7 mm sieve, Table 1)[3]. Noticeably, Low +KP achieved a BPS more than three times higher than the 17% suggested as an initial goal by other authors[4].

Sorghum silage harvested with this outstanding berry processing combined with a fermentation length of 90 days achieved a remarkable rumen in-situ starch digestibility. Regardless of cut height, using KP and fermentation length of 90 days roughly doubled the in-situ starch digestibility compared to not using KP. Noticeably, the in-situ starch digestibility after seven hours of incubation increased after ensiling both cut heights when harvesting with KP and ensiling for 90 days but not without KP. This may happen due to the increased access of bacteria to starch during the ensiling time in the treatments with KP where berry processing was successful whereas the pericarp would impede bacterial access to the starch in the Low noKP treatment.

	Low noKP		Low +KP		High +KP			*P*-value		
Item	**0 d**	**90 d**	**0 d**	**90 d**	**0 d**	**90 d**	**SEM**	**HS**	**ET**	**HS*ET**
ADF, % DM	24.3^{a}	23.9^{a}	22.1^{a}	22.0^{ab}	15.9^{c}	16.8^{bc}	1.13	<0.01	0.91	0.85
aNDFom, % DM	34.2^{a}	33.3^{a}	30.4^{ab}	27.5^{b}	22.2^{c}	22.4^{c}	1.05	<0.01	0.14	0.25
Starch, % DM	33.1^{b}	30.6^{b}	37.2^{b}	36.7^{b}	52.1^{a}	51.2^{a}	1.67	<0.01	0.29	0.76
1.7 mm BPS, % starch	7.7^{c}	8.6^{c}	55.8^{b}	56.7^{b}	70.1^{a}	71.6^{a}	1.28	<0.01	0.22	0.93
isSD7, % starch	29.0^{b}	25.8^{b}	39.9^{b}	65.9^{a}	36.2^{b}	66.7^{a}	4.62	<0.01	<0.01	<0.01

Table 1. Nutrient composition, berry processing score (BPS), and rumen in situ starch digestibility after 7 hours of incubation (isSD7) of sorghum silage with two different ensiling times (0 or 90 days) and processed with three different harvesting strategies (Low noKP: low cut height without KP, Low +KP: low cut height with KP, High +KP: high cut height with KP). Numbers with different superscripts are significantly different.

Increasing the cut height did not increase in situ starch digestibility

We hypothesized that increasing the cut height from 8 inches to 48 inches, to increase the sorghum panicle to stover proportion, would increase berry processing and in situ starch digestibility. Compared to Low +KP, High +KP increased the BPS by roughly 26%. However, there was no significant difference between Low +KP and High +KP on in situ starch digestibility (Fig. 2). Perhaps this could be attributed to both treatments achieving a very good BPS. Johnson (2017) proposed a BPS of >50% as adequate[5]. In this study, the BPS of Low +KP and High +KP were roughly 56% and 71%.

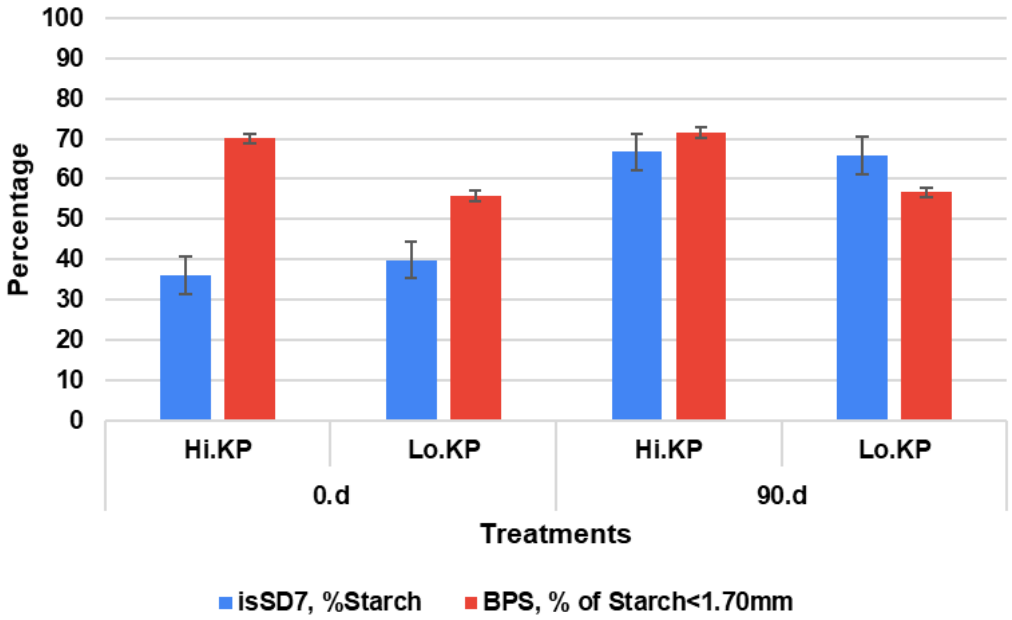

Figure 2. The effect of increasing the cut height from 0.2 to 1.2 m to increase the panicle to vegetative plant parts ratio on berry processing score (BPS) and rumen in-situ starch digestibility (isSD7). Compared to harvesting with low cut height without KP (Low +KP), harvesting with a high cut height with KP (High +KP) did not increase isSD7.

Our results suggest this new processing technology combined with a 90-day ensiling time increases sorghum berry processing and in-situ starch digestibility, and increasing cut height may increase BPS but may not further increase in-situ starch digestibility. The remarkable 66% of rumen in-situ starch digestibility after seven hours of incubation achieved is 12% below the 75% average from Rock River Lab for corn silage in the U.S[6]. Future studies should assess the effect of further increasing ensiling time in sorghum silage harvested with this technology on starch digestibility.

Acknowledgements

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References

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