
Evaluation of warm-season annual baleage in a cow-calf production system

The focus of this Timely Information sheet is to highlight the results of a research study conducted at the E.V. Smith Research Center regarding warm-season annual forage harvested as baleage as a winter feed source for lactating beef cows.

Introduction

In a fall calving system, it is often difficult to supply cow-calf pairs with adequate quantity and quality of grazed forage because this coincides with a time when warm-season perennial pastures are entering dormancy and cool-season forages have insufficient growth to be grazed. Baleage, or high moisture forage baled and ensiled at 40 to 60% moisture, may provide an alternative source of stored high-quality forage during this time compared to traditional hay feeding systems.

What were the goals of this study?

- To determine forage quality and utilization associated with pearl millet (**PM**) and sorghum × sudangrass (**SS**) harvested as baleage compared with bermudagrass hay (**BG**).
- To determine if hay ring design (open vs. cone-shaped) influences cattle feeding behavior and forage waste.
- To compare cow and calf performance traits (weight, body condition score, milk production) among forage and ring treatments.
- To evaluate costs between forage and ring types.

What was evaluated?

36 crossbred Angus × Hereford cows (average initial BW=1,350 lbs) and their calves were randomly assigned to:

- One of the 12 pastures with: PM baleage, SS baleage, or bermudagrass hay and either an open- or cone-shaped ring (12 cow-calf pairs per forage treatment; 3 cow-calf pairs per pen). Baleage bales were 48 in × 60 in and the average weight of PM and SS were 1,627 lbs. and 1,761 lbs., respectively. Similarly, hay bales were 48 in × 60 in but had an average weight 1,062 lbs.
- Cow and calf weights were recorded on Day 1, 30, and 52 and cow BCS was recorded on Day 1 and 52 of the feeding trial.
- Cow milk production was measured by the weigh-suckle-weigh technique at 55 and 74 days postpartum.
- PM and SS baleage was replaced every 5 days and bermudagrass hay was replaced every 10 days; forage refusal was measured at this time.
- Forage quality parameters were measured from core samples, including: ash, crude protein (**CP**), in vitro true digestibility (**IVTD**), neutral detergent fiber (**NDF**), acid detergent fiber (**ADF**), and acid detergent lignin (**ADL**).

Forage Nutritive Value (Table 1)

- There were no differences in forage nutritive value between PM and SS baleage. PM and SS baleage had greater digestibility compared with BG hay. Greater ash concentration with these forages is related to contamination from soil, etc. during the harvest and baling process.
- BG hay had greater crude protein than PM and SS baleage, but was less digestible, as illustrated by the increased fiber concentration and lignin values compared to the baleage sources.

Table 1. Chemical composition and in vitro true digestibility (IVTD) of experimental forages

Forage	Item (% DM basis)					
	Ash	CP	IVTD	NDF	ADF	ADL
PM Baleage	10.3 ^a	14.0 ^b	74.0 ^a	58.8 ^b	33.9 ^b	4.5 ^b
SS Baleage	9.8 ^a	13.9 ^b	78.0 ^a	55.2 ^b	32.5 ^b	3.8 ^b
Bermuda Hay	5.7 ^b	15.2 ^a	58.9 ^b	74.4 ^a	39.2 ^a	7.1 ^a

^{a,b} Within a column, means without a common superscript differ ($P < 0.10$).

Forage Waste

- There were no statistical differences in forage waste between open and cone-shaped hay ring treatments. Mean % forage waste was the following: open=19% and cone=15%.
- Percent of waste from PM and SS baleage was greater than that of BG. Mean % forage waste was the following: PM= 24%, SS= 20%, and BG= 7%. Greater waste associated with baleage is attributed to spoilage during the feeding window. Bales should be replaced more frequently (3 days or less) to reduce wastage in summer annual baleages.

Animal Performance

- There were no differences in cow BW or BCS among forage or between ring-shape treatments. All cows maintained a body condition score of 5.5 to 6 during the feeding period, which coincided with peak lactation.
- All cows produced a similar amount of milk in a 24-hr period regardless of forage diet provided. The average amount of milk produced by each cow during a 24-h period was 15 lbs.
- All calves had an ADG of 2.4 lb/day, and there were no differences across forage diets fed to cows.

Economic Analysis (Table 2)

- Cost/ton DM was 16 and 24% greater for PM and SS baleage, respectively when compared with bermudagrass hay. The costs that were included in this analysis were seed, fertilizer, lime, weed control, custom spread applications, machinery and equipment, labor, operating interest, soil test, and land rent. The establishment costs for bermudagrass were amortized over a 10-year expected useful life of the stand. Treatments that included pearl millet and sorghum-sudangrass were only expected to have a 1-year useful life and were not amortized.

- It costs \$16.54 and \$26.24 more to feed each cow-calf pair for 52 days using PM and SS baleage, respectively.
- Cost savings (\$/cow-calf pair for 52 days) utilizing a cone-shaped ring rather than an open-shaped ring were \$3.44, \$5.40, and \$2.15 for PM baleage, SS baleage, and bermudagrass hay.

Table 2. Estimated cost associated with PM and SS baleage or bermudagrass hay.

		Treatments ¹		
Item	Ring Type ²	PM Baleage	SS Baleage	BG Hay
\$/ton DM	-	\$124	\$136	\$104
\$/cow-calf pair/day	-	\$1.97	\$2.16	\$1.65
Cost of feeding for 52 days	-	\$102.55	\$112.47	\$86.01
Cost of waste, \$/pair/day	-	-	-	-
	Open	\$0.51	\$0.48	\$0.13
	Cone	\$0.45	\$0.38	\$0.09
Cost of waste, \$/pair for 52 days	-	-	-	-
	Open	\$26.68	\$25.02	\$6.95
	Cone	\$23.24	\$19.61	\$4.79

¹PM baleage = pearl millet baleage; SS baleage = sorghum × sudangrass baleage; BG Hay = bermudagrass hay.

²C = cone-shaped ring; O = open-shaped ring.

Take Home Points

- The additional cost of machinery and plastic wrap needed to harvest forage as baleage should be compensated with increased animal performance or a reduction in labor and storage costs for a producer to profit from this management practice.
- Because there were no differences in animal performance, this study suggests it would not be economical to harvest warm-season annual forage as baleage to supplement lactating beef cows during a fall-winter forage gap.
- Harvesting warm-season annual forage as baleage might be more economical for a producer with cattle having higher CP and IVTD requirements, such as growing steers or lactating dairy cows, or for a producer who already owns baleage equipment and/or contract wraps cool-season baleage.
- PM and SS baleage had increased waste compared with bermudagrass hay, and there was a 4% difference in waste among ring types in this study.

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