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Effects of Supplementing Corn Silage to Fall-Calving Heifers and Cows Grazing Bermudagrass and Calf Performance and Physiology

J.W.L. Banks, J.K. Farney, K.E. Fike, J.M. Warner

Summary

The objective was to test the effect of supplemental feeding on cows grazing bermudagrass pastures on cow-calf performance and pasture management. In a completely randomized design, (n = 24) primiparous and multiparous Angus-based cross cows were allocated to bermudagrass pasture with one of two levels of supplemental feeding (non-supplemented or supplemented at 1% of BW on a DM basis of corn silage). Each treatment consisted of (n = 4) pastures stocked with three cows of different ages, a young (first-calf heifer), middle-aged (3-5 yrs.), and old (≥ 6 yrs.) cow, each averaging 155 ± 14 d of gestation at turnout. Cows were fed silage (32-42% DM and 7.83% CP) daily in fence-line bunks, with feeding amount being adjusted at each weigh date. Cows were weighed on 2 consecutive days prior to turnout (middle of the second trimester), midpoint (beginning of the third trimester), and at about 2 weeks prior to the estimated calving date for the herd. Body weight, body condition score, hair score, hair length, and rump fat measurements were taken at each weigh date. Following the final measurement day, cows were relocated to calving pastures consisting of a mixture of bermudagrass, tall fescue, and prairie grass. Supplemental feeding of late gestation fall-calving cows on bermudagrass pasture did not have an effect on cow-calf performance, calf birth weights, and milk output. However, supplemental feeding of cows with corn silage during the summer resulted in 31% more available forage in the pastures. Overall, there were minimal differences in cow performance while grazing bermudagrass pastures during the summer and with supplemental feeding of corn silage. The greatest advantage comes from a greater amount of forage available, which may offset periods of drought or allow producers to increase stocking rates on their property.

Introduction

Bermudagrass (*Cynodon dactylon*) is revered as the go-to warm season perennial for pasture and hay production in the southern U.S. (Hill et al., 2001). Bermudagrass has multiple different hybrids, but the most prevalent cultivar is Coastal bermudagrass, which occupies more than 4×10^6 acres nationwide and was developed by Glenn Burton, USDA-ARS, Tifton, GA. This cultivar gained popularity for its notable adaptability, stability, yield, and quality (Hill et al., 2001). Though bermudagrass is usually known to inhabit the deep southeastern sectors of the U.S. (Aiken, 2002). Bermudagrass can

also be used in conjunction with cool season forages like fescue (Stokes et al., 1988), ryegrass, and/or clover (Rouquette, 2017) to extend the grazing season in the central plains (Peel, 2003; Mullenix and Rouquette, 2018). According to Kallenbach (2015), 50% or less of available dry matter (DM) in a mixed-species pasture is credited to fescue, especially in the summer months. This percentage relies heavily on annual precipitation, fertilization, grazing management, and the interspecies competition that can be expected in the dynamic of pairing cool- and warm-season grass growth (Kallenbach, 2015).

A two-year study by (Aiken, 2002) investigated the impact of supplemental feeding of yearling steers grazing bermudagrass with different amounts of ground corn on their average daily gain (ADG) and feed cost. The researchers concluded that feeding steers at 0.99 and 2.97 lb per calf per day increased ADG, with the 2.97 lb per calf per day treatment having the lowest cost per additional ADG unit for the grain and cattle prices during the time of the experiment (1998-1999; Aiken, 2002). Wheeler, et al., (2002) looked at how the supplemental feeding of protein (soybean meal) in increasing amounts to beef cows on stockpiled bermudagrass pasture affected performance. Cows being supplemented lost more weight and body condition during the first year of the study than their non-supplemented contemporaries. But in year two, supplemented cows gained more weight and lost less body condition. Additionally, forage intake tended to increase in supplemented cows, though the amount of protein supplementation did not have an effect (Wheeler et al., 2002). In a digestion trial with (n = 4) steers, forage intake increased 16% and OM intake increased 30% in supplemented steers compared to non-supplemented steers (Wheeler et al., 2002). Diet OM digestibility also increased 14.5% and total digestible OM intake increased 49% in supplemented compared to non-supplemented steers.

The goal of this study was to explore how the inclusion of corn silage would affect the physiology and performance of cattle grazing bermudagrass pasture, with a secondary objective of increasing forage savings in an intense drought environment.

Experimental Procedures

Cow and Calf Measurements

The study was conducted at the Mound Valley Branch of the Southeast Research and Extension Center in Mound Valley, Kansas. Cows were allocated to one of eight bermudagrass pastures, with four pastures being non-supplemented and four pastures being supplemented at 1% of BW corn silage on a DM basis in fence-line bunks. Both treatments had access to free choice mineral. Following a two-day weigh period, cattle were turned out on June 1, 2023, then weighed again on June 21, 2023, and at end of the study for two consecutive weights on October 2-3, 2023. These time points corresponded with mid-gestation, beginning of third trimester, and about 2 weeks prior to the start of calving. Following turnout to calving pastures, pairs were gathered and sorted for a calf weigh-suckle-weigh on December 7, 2023.

Weight measures: Cattle were restrained in an Arrowquip Q-Power 107 Series hydraulic squeeze chute (Arrowquip, Woodlands, MB), with weights being recorded by a Gallagher TWR chute scale head (Gallagher Group Limited, Riverside, MO). Average weights at the beginning and middle of the experiment were used to adjust feed alloca-

tion. Initial, middle, and ending weights were used to determine the total body weight change. Calf birthweight was also collected via hanging scale. Weights were recorded in pounds (lbs).

Body condition score and rump fat: Three blind, independent evaluators recorded body condition scores at each measurement period using the standard 0-9 scale. Rump fat was recorded using an ALOKA 500 ultrasound machine (Hitachi, LTD., Wallingford, CT) with a 3.5-megahertz short probe capturing the image in Cattle Performance Enhancement Company software. Measurement was taken over the rump by a trained technician and recorded in millimeters (mm).

Hair score and hair length: One independent technician evaluated hair scores at each measurement period using the standard 1-5 scale. Hair length was taken chute side using a slide ruler and recorded in millimeters (mm).

Calf weigh-suckle-weigh: Pairs were gathered and sorted, with calves being separated from dam overnight. Calves were then weighed empty. After empty weight was recorded, calves were turned back in with their dams to nurse until full. Then calves were sorted once more and weighed to get a "full" weight and separated from dams for 8 hours. Then calves were weighed "empty," allowed to nurse, and then weighed again. The empty weight was then subtracted from the full weight to determine the change in calf body weight due to milk.

Pasture Measurements

Forage mass: Forage mass per square foot was collected every 28 days by sampling a 1 by 1 ft area that was being grazed by the cows. This measurement was used to determine the amount of available forage for the cows. These samples were clipped with about one inch of stem remaining.

Forage accumulation: This was used to determine the amount of forage that was growing and was measured using the pair-cage method. Within each pasture there were 4 exclusion cages that were sampled via clipping a sample every 28 days. Then the cages were moved to another location within the pasture. To calculate forage accumulation the amount of forage measured within the exclusion cage was used and then the amount of forage measured from outside the cage during the previous 28 days was subtracted.

Nutritional quality: Hand-grab samples were taken at the beginning of grazing, middle of grazing, and end of grazing. This technique was used to more accurately determine the consumed nutritional quality of the pastures the cows were grazing.

Results

Cow Performance

There was no statistical difference in body weight change between treatment groups from the middle of second trimester to about 2 weeks prior to calving (Table 1). There was also no difference regarding supplemental feeding on calf birthweight, and there was no difference in estimated milk production of the cows via the weigh-suckle-weigh measurement methods. Additionally, cow body condition score and rump fat thickness

were not impacted by supplementation methods. Cows all had slick hair coats and were not impacted by the feeding regimen.

Pasture Measurements

Forage mass was increased by 31% with supplemental feeding of cows with 1% of body weight on a dry matter basis of corn silage. Forage accumulation was the same for both feeding groups. The pastures where cows were grazing bermudagrass without supplemental feed bermudagrass had greater total digestible nutrients (TDN) and lower acid detergent fiber (ADF). All other measures of pasture nutritional quality were the same.

Conclusions

Supplementally feeding the late gestation, fall-calving cows grazing bermudagrass pasture did not impact cow or calf performance. There was a 31% increase in forage savings due to supplemental feeding. When estimating forage intake, forage quality, and silage quality the estimated calories and pounds of protein consumed for each set of cows were the same, which led to observations of similar performance results for these cows. There was about a 1:1 substitution on a dry matter basis when feeding the silage; for each pound (dry matter) of silage the cows consumed, they ate a pound (dry matter) less of the pasture. This feeding practice could be used in years of good precipitation to increase your pasture's carrying capacity or possibly in drought years it could be used to reduce grazing pressure on the pasture. Based on 2023 costs of production, supplemental feeding of cows with corn silage on pasture did make economic sense.

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Table 1. Cow and calf performance results

	Treatment			
Item	**Non-Supplemented**	**Supplemented**	**SEM**	***P*-value**
Initial weight, lb	1205	1214	48	0.89
Mid-point weight, lb	1358	1418	49	0.39
Final weight, lb	1433	1498	50	0.37
Total weight gain, lb	228	269	31	0.37
Initial body condition score (scale 1-9)	5.25	5.15	0.16	0.69
Mid-point body condition score	5.44	5.72	0.16	0.23
Final body condition score	6.18	6.36	0.16	0.44
Change in body condition score	0.95	1.21	0.26	0.50
Initial rump fat, mm	6.86	7.61	0.81	0.51
Final rump fat, mm	10.36	13.81	1.52	0.12
Calf birth weight, lb	79	74	4	0.43
Calf weight due to milk, lb[1]	7.8	8.8	1.7	1.00

Initial time point is the beginning of the study when cows are in mid-gestation. Mid-point is the middle of the grazing period when cows are at the beginning of their third trimester. Final points are about 2 weeks prior to calving and the end of the grazing period on bermudagrass.

[1]Calf weight gain from empty is used to estimate a cows' milk production.

Table 2. Pasture production based on treatments (results are on a dry matter basis)

	Treatment			
Item	Non-Supplemented	Supplemented	SEM	*P*-value
Forage mass, lb/a	2190	2879	231	0.09
Forage accumulation, lb/a	1497	1472	105	0.88
Crude protein, %	12.8	11.6	0.49	0.15
Total digestible nutrients (TDN), %	55.9	54.6	0.33	0.01
Acid detergent fiber (ADF), %	30.1	31.2	0.27	0.01
Neutral detergent fiber (NDF), %	53.4	55.4	1.09	0.25
Calcium, %	0.49	0.46	0.03	0.38
Phosphorus, %	0.24	0.22	0.01	0.24
Potassium, %	1.89	1.78	0.11	0.63
Magnesium, %	0.23	0.20	0.02	0.33

Table 3. Estimated operational cost and returns based on traditional method or supplementally feeding cows with corn silage on bermudagrass (based on 2023 cost of production)

Item	Traditional	Supplemental feeding
Carrying capacity, hd[1]	89	131
Fertilizer costs, 300 acres[2]	$23,259	$23,259
Cow costs for herd[3]	$17,723	$26,087
Grazing cost for herd remaining 240 day[4]	$29,459	$43,453
Silage cost, 100 days	--	$17,292
TOTAL COSTS	**$70,441**	**$110,091**
Calf sale price[5]	$120,630	$177,557
REVENUE	**$50,189**	**$67,466**
Difference		*$17,277*

[1]Carrying capacity specs: 300 acres of bermudagrass using forage mass numbers at 50% utilization for 120 days
[2]Urea $573/ton used $61.34/acre by 300 acres; DAP $745/ton used on average $16.19/acre by 300 acres
[3]Cow costs (yearly) not including feed or pasture based on Kansas Farm Management Association of $597.42/cow. Divided by 1/3 since bermudagrass is grazed for only 1/3 of production year.
[4]Feed and pasture costs (yearly) based on KFMA = $502 times 2/3 (remainder of year on bermudagrass we have accounted for) = $331/cow.
[5]Calf sale price assumes 90% of calf crop is sold for $251/cwt, and 600 lbs split into 1/3 based on 1/3 of cow life on bermudagrass.
[6]Silage $55/ton as-received. Fed average of 40 lbs as-is silage/day/cow.