MILK PRODUCTION AND QUALITY ON COASTAL OR TIFTON 85 BERMUDAGRASS PASTURES.

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ABSTRACT

Milk quality was determined in a 2-yr 2 X 2 factorial grazing study using Coastal (C) or Tifton 85 (T85) replicated bermudagrass pastures (4 pastures each; 4.86 ha/yr), with (CG) and without (NCG) access by calves to aeschynomene creep grazing paddocks (n=4; 0.202 ha). On Jun 10, 2004, and Jun 8, 2005, 96 tester winter-calving beef cows and their calves were grouped by cow breed (9 Angus, 3 Polled Hereford/group), initial cow BW (592.9 ± 70.1 kg, 2-yr mean), age of dam (AOD), initial calf age (117 ± 20.1 d), initial calf BW (161.3 ± 30.4 kg), and randomly assigned to pastures. Tester calf 91-d ADG (kg) for C vs. T85 were: 0.79 vs. 0.94 (SE 0.02, $P < 0.01$), and NCG vs CG: 0.82 vs. 0.90 (SE 0.02, $P < 0.03$). Angus cows (n=40; 5 cows/treatment) were selected for milking by cow BW, breed, AOD, and calf age. Cows were milked once in yr 1 (Aug 10, 2004; d 62) and twice in yr 2 (Jun 28, 2005; d 20; and Aug 9, 2005, d 63). Milk weight (kg) by C NCG, C CG, T85 NCG and T85 CG, respectively were: (Aug 2004) 3.55, 2.38, 2.79, 2.88; (Jun 2005) 3.94, 3.95, 4.04, 3.85; (Aug 2005) 2.15, 2.69, 1.81, 3.03. A forage X creep grazing interaction ($P < 0.06$) occurred for milk weights; and, milk protein (%) was higher for cows on T85 than C (3.42 vs. 2.97; $P < 0.01$), and for NCG than CG (3.36 vs. 3.03; $P < 0.05$). Trends for higher milk fat (%) on T85 than C (3.24 vs. 2.56; $P > 0.10$), and for NCG compared with CG (3.23 vs. 2.57; $P > 0.10$) were recorded. Higher milk fat and protein in cows on T85 pastures contributed to higher calf ADG on T85 pastures.

INTRODUCTION

In beef, cow-calf production, calf-weaning weights have important economic implications. Weaning weights are affected by the genetic potential of the calves for growth and the calves preweaning environment. Part of this preweaning environment is milk production of the dam, which may account for 40% of the variance in 205-d weight (Robison et al., 1978), and it is the most important postnatal maternal influence on preweaning growth in beef cattle (Willham, 1972). Research indicates that the nutritional environment of the cow and calf influences level and content of milk produced (Brown et al., 1993).

High DMI is critical for supplying required nutrients to support high milk yield. Indigestible DM in the diet can be a major constraint to the DMI of ruminants (Conrad, 1966), and DMI is positively correlated with digestibility of the diet (Waldo et al., 1981). Bermudagrass is well adapted to wide regions of the southern US, but bermudagrass has high NDF content and a slower rate of NDF digestion compared with legumes such as alfalfa. Lactating dairy cows were offered diets containing increasing quantities of T85

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hay or silage and increasing dietary NDF to determine effects of method of bermudagrass storage and dietary fiber content on intake, milk yield, and nutrient digestion (West et al., 1998). Holstein cows offered diets with increasing proportions of NDF from Tifton 85 resulted in similar DMI and milk yields for lactating dairy cows. The digestibility of NDF of the diets improved as the percentage of bermudagrass increased, reflecting the high digestibility of NDF from bermudagrass. High quality Tifton 85 bermudagrass hay or silage can be used in dairy diets with similar effectiveness, and Tifton 85 can be used as a source of digestible fiber for lactating cows to supplement high-energy diets. Our objective was to compare cow milk production and quality on Tifton 85 versus Coastal pastures.

MATERIALS AND METHODS

Grazing Experiment

Summer cow and calf performance was determined in a 2-yr replicated 2 × 2 factorial experiment using Coastal (C) or Tifton 85 (T85) bermudagrass pastures (4 pastures each; 4.86 ha each) without (NCG) or with aeschynomene (*Aeschynomene americana L.*) creep grazing (CG) paddocks (0.202 ha creep grazing area in each CG pasture; planted in May of each year at 13.44 kg/ha). The creep areas were divided by electric feces with access through wooden creep gates [4 M long (6 openings, 38 cm wide) by 1.22 M high] to each 0.202 ha paddocks. Aeschynomene was planted using a Brillion Seeder (Brillion Iron Works, Inc., Brillion, WI). The C and T85 pastures were established several years prior to initiation of this grazing experiment. Bermudagrass pastures were (Tifton sandy loam soils) fertilized with a blended fertilizer (24-6-12, N–P_2O_5–K_2O, at 336, 280, and 224 kg/ha, respectively, in March, early June and late July each year) following historical bermudagrass fertilizer recommendations. In the variable stocking rate study that began on June 10, 2004 and June 8, 2005, 96 winter-calving “tester” beef cows and their calves were grouped by cow breed [9 Angus (AN), 3 Polled Hereford (PH)/group], initial cow BW (592.9 ± 70.1 kg, 2 yr mean) age of dam (AOD), calf-breed (AN, PH or AN × PH), calf sex, initial calf age (117 ± 20.1 days, 2-yr mean), and initial calf weight (161.3 ± 30.4 kg, 2-yr mean) before groups were randomly assigned to pastures. Cows and calves were grazed in a put-and-take (Mott and Lucas, 1952) grazing management system. Cows similar to the tester cows in BW, age, background, and breeding were designated as “grazer” cows, and were used to adjust forage mass in pastures. Additional grazer cows included dry pregnant cows and replacement heifers (18 mo. of age). Total pasture forage mass was targeted at approximately 2,800 kg of DM/ha because we wished to provide enough forage to allow detection of differences in nutritive value of the forages unlimited by forage mass. At 14-d intervals beginning in June, forage mass was estimated using a double sampling procedure. Four quadrats (.1 m^2) were clipped to ground level in each pasture, and clipped samples were oven-dried. Pooled estimates were converted to a moisture-free basis using pooled DM values. Stocking rates were adjusted by addition or removal of grazer cows to achieve the targeted 2,800 kg of DM/ha in each pasture. Cows and calves were weighed at 28-d intervals, and initial and final BW were means of consecutive daily full weights. A commercial mineral (NaCl [maximum] 16.8%; Ca [maximum] 19.20%; P [minimum] 8.0%; Mg [minimum] 1.00%; Cu [minimum] 0.15%; Zn [minimum] 0.27%; Se [minimum] 0.003%; Beef 8™, W.B. Fleming Co., Tifton, GA) was provided free choice along with water in each pasture. All cattle were managed under procedures approved by the University of Georgia Animal Care and Use Committee Guidelines (IACUC AUP #A2005-10179-c1; Univ. of Georgia Animal Welfare Assurance #A3437-01).

Milk Production and Quality

Angus cows with calves with similar cow BW, AOD, calf age, sex, and breed were selected for milking. Cows were milked once in yr 1 (n = 40, 5/grazing pasture; August 10, 2004; d 61) and twice in yr 2 (n = 48, 6/grazing pasture; June 28, 2005; d 20; and, August 9, 2005; d 62). The average postpartum interval when cows were milked was 176 d in yr 1, and 139 d and 181 d in yr 2. Calves were separated from dams for 5 h then allowed to nurse for 30 min approximately 12 h prior to milking. Each cow was injected with 2 mL acepromazine IM and 1 mL of oxytocin IM before milking. The acepromazine was administered 10 min prior to milking for sedation. Each cow was milked with a portable milking machine, and milk was weighed, stirred and two 30 mL samples were collected. One milk sample from each cow was frozen and retained, and one sample at each milking date was analyzed for somatic cell count, fat and protein (Southeast Milk, Inc., Belleview, FL).

Statistical Analyses

Milk weights, milk fat and protein were analyzed using Mixed Model Procedures of SAS (2003) for each milking in each year. Milk weight, milk fat and protein percentages were analyzed as a split plot with the main plot being the eight pasture treatments arranged as a factorial with two replications; subplots were the five (yr 1) or six (yr 2) cow-calf pairs selected in each pasture. The following covariates were considered in the milk analyses: calf age, calf sex, calf breed, calf BW, AOD, and cow milk EPD. Unless otherwise noted, significance levels are reported at $P = 0.05$.

RESULTS AND DISCUSSION

Milk Production and Quality

The differences in forage quality of the small plots, grazed pastures, and previous research with Tifton 85 (West et al., 1997; Mandebvu et al., 1999; Hill et al., 2001; Corriher et al., 2007) created interest in determining potential for beef cow milk production differences, and for milk effects on calf performance. This experiment was designed to begin in early June, consequently milking occurred during the middle to latter stages of milk production for cows calving in January and February. In 2004, a forage × creep grazing interaction ($P < 0.06$; Figure 1) was observed for milk weights, with highest 12 h milk yield on C NCG, and lowest on C CG ($P < 0.05$). Milk weight was adjusted for age of dam as the only significant covariate. In June 2005, milk yield was similar ($P > 0.10$, Figure 3) for treatments, with no forage × creep grazing interaction ($P > 0.80$), and milk weights were adjusted for covariate effects of AOD, calf BW, age, and sex. In August 2005, milk yield data was affected by a forage × creep grazing interaction ($P < 0.06$; Figure 3). The milk yield was higher ($P < 0.05$) for cows on CG treatments than on NCG, with higher ($P < 0.05$) milk yield on T85 CG than C CG, and Milk yield was higher ($P < 0.05$) for T85 CG than T85 NCG. The August yield data were adjusted for AOD as a covariate. August milk yield patterns were inconsistent for the two years with lower milk yield on C CG than T85 CG in both years, but with highest yields on C NCG in yr 1, and on T85 CG in yr 2. Milk yields were higher in June than in August in 2005 (Figure 3), reflecting the reduced postpartum interval of cows at the June milking date. Research has indicated higher 12 h milk production for cows grazing T85 compared with cows grazing C with volunteer ryegrass (Hill et al., 1998). In experiments over longer intervals, West et al. (1998) reported similar DMI and milk yields for lactating Holstein cows offered diets with increasing proportions of NDF from T85 bermudagrass hay. In an earlier experiment (West et al., 1997), Holstein cows had similar DMI per 100 kg BW when fed diets containing either T85 bermudagrass or alfalfa hay. In a beef cow and calf grazing experiment (Bagley et al., 1997) cows in creep grazing systems did not produce as much milk as cows in non-creep grazing systems. Calves may compensate for reduced milk production of cows with higher BW gains later during the year because of increased DMI of higher quality creep grazing forage. In the present study, milk fat was numerically higher for cows on T85, and milk protein was higher ($P < 0.05$; Figure 2) in yr 1 for cows grazing T85 compared with cows grazing C; milk protein was also higher ($P < 0.05$) for cows on NCG than CG treatments, and there was no forage × creep grazing interaction ($P > 0.10$). In yr 2, milk fat was variable among treatments, with somewhat ($P > 0.10$) for higher concentrations on C than T 85, and CG than NCG (Figure 4a,b). Milk protein in yr 2 was similar for treatments in June (Figure 4a), but milk protein was higher ($P < 0.05$; Figure 4b) for T85 than C in August. There were no covariate or interaction effects ($P > 0.10$) for milk fat or milk protein data in yr 2. Hill et al., (1998) reported higher milk fat and higher milk protein for cows grazing T85 pastures with and without alfalfa creep grazing than for cows grazing C pastures with ryegrass. The trends for higher ($P > 0.10$) milk protein in the August, 2004 (Figure 2) and June, 2005 data (Figure 4a), and higher ($P < 0.05$) milk protein in August, 2005 (Figure 4b) data in cows grazing T85 pastures indicate that the higher milk protein produced on these pastures contributed to higher calf gains recorded for T85 treatments.

CONCLUSIONS

Milk protein tended to be higher for cows grazing Tifton 85 than C pastures, contributing to calf gains on Tifton 85 pastures. Higher milk fat and protein in cows on T85 pastures contributed to higher calf ADG on T85 pastures. Results suggest higher gains from calves grazing Tifton 85 bermudagrass during the summer could improve production efficiency in cow-calf operations across much of the southeastern United States.

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Figure 1: Mean estimates of milk yield (kg/12 h) August 10, 2004 (176 d postpartum) determined by machine milking in Coastal and Tifton 85 pastures with or without aeschynomene creep grazing. (C = Coastal; T85-Tifton 85; NCG = without creep grazing; CG = with creep grazing; SE = 0.33, LSD = 0.95, 36 df).

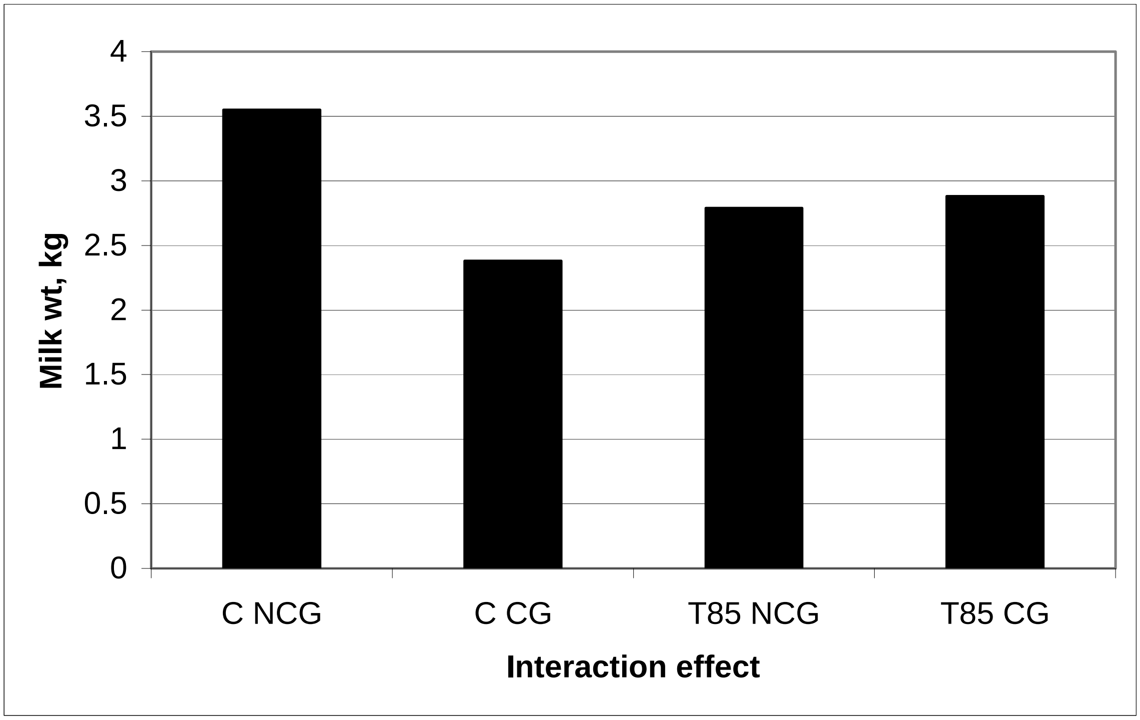


Figure 2: Mean fat and protein percentages in milk collected by machine milking on August 10, 2004 (176 d postpartum) adjusted for calf weight and cow milk EPD. (C = Coastal; T85-Tifton 85; NCG = without creep grazing; CG = with creep grazing; Fat, SE = 0.41, LSD = 1.60, 4.1 df; Protein, SE = 0.22, LSD = 0.63, 33 df).

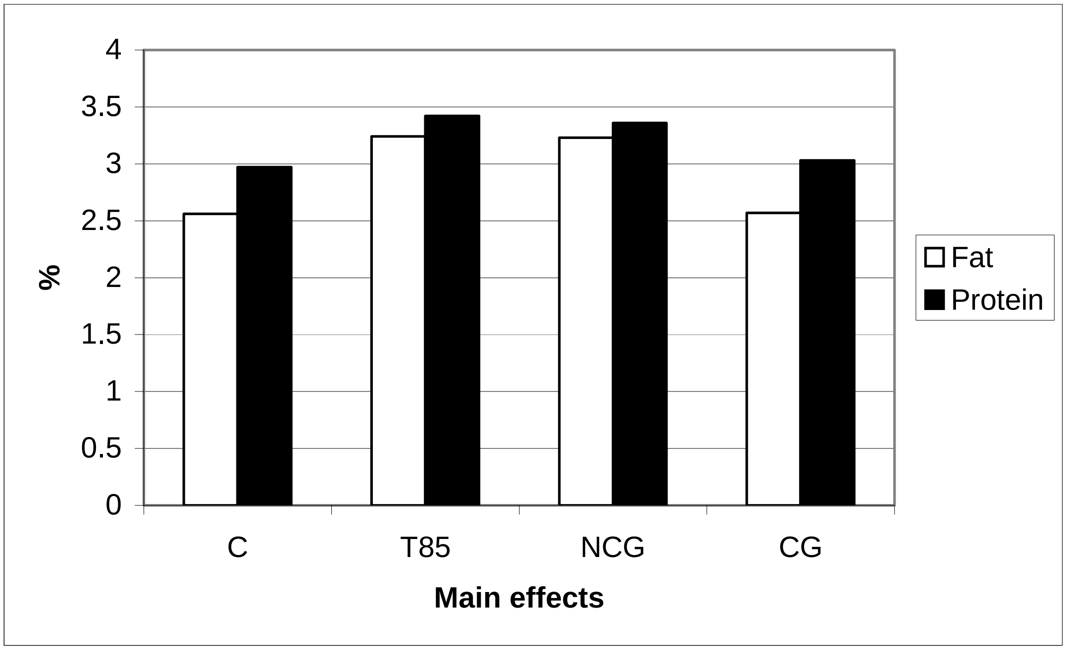


Figure 3: Mean estimates of milk yield (kg/12h) on June 28 and August 9, 2005 (139 d and 181 d postpartum, respectively) determined by machine milking in Coastal and Tifton 85 pastures with or without aeschynomene creep grazing adjusted for calf sex, calf breed, AOD, calf weight, and calf age. (C = Coastal; T85-Tifton 85; NCG = without creep grazing; CG = with creep grazing; June, SE = 0.25, LSD = 0.71, 38 df; August, SE = 0.26, LSD = 0.75, 38 df).

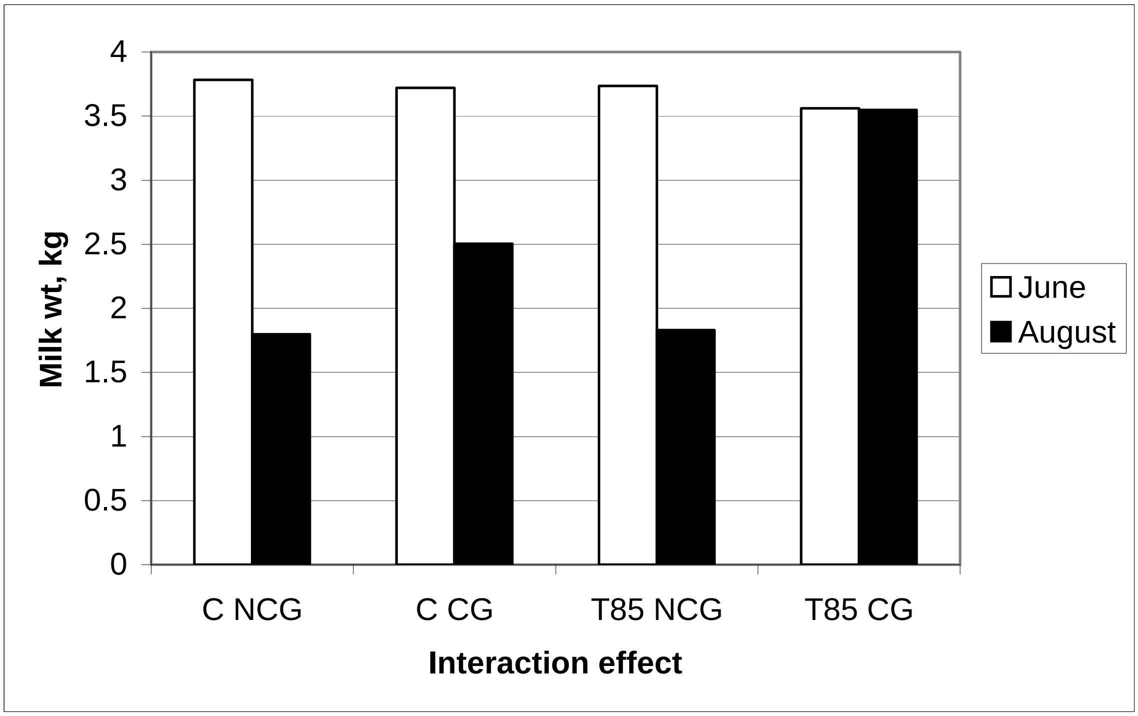
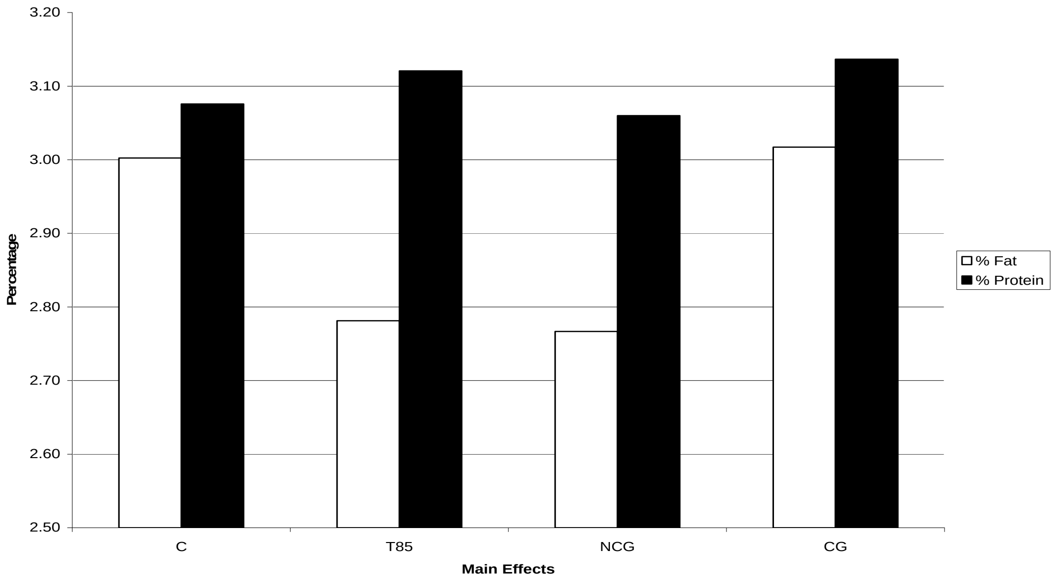


Figure 4. Mean fat and protein percentages of milk collected by machine milking in June 28, 2005 (139 d postpartum) and August 9, 2005 (181 d postpartum). (C = Coastal; T85 = Tifton 85; NCG = without creep grazing; CG = with creep grazing; June (a), Fat, SE = 0.13, LSD = 0.38, 44 df; Protein, SE = 0.22, LSD = 0.62, 44 df; August (b), Fat, SE = 0.04, LSD = 0.11, 44 df; Protein, SE = 0.11, LSD = 0.31, 44 df).

(a.)



(b.)