

Peanut Stover and Bermudagrass Hay for Nanny Kids on Winter Hardwood Range in North-central Texas

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ABSTRACT

Goats in north-central Texas raised on range often face a winter forage quantity and quality deficit that may be mitigated by feeding hay or stover. Peanut stover [10% crude protein (CP), 40% acid detergent fiber (ADF)] and bermudagrass hay (12% CP, 33% ADF) were tested at Stephenville Texas as a 0.0, 0.5, and 2.0% body weight (BW) supplement/substitution on 40 lb Boer X Spanish goat nanny kids that browsed native hardwoods (8 head ac⁻¹) and *ad libitum* in a traditional feedlot, using a complete feed ration as a control. For 10 weeks from January to March in 2003 (5 in. rainfall) and in 2004 (7 in. rainfall) average daily gains (ADG) were measured and ADF and CP concentration of the primary browse species were determined. Goats receiving 0.5% and 2% BW bermudagrass or 2% BW peanut stover had greater ADG than those in the control and 0.5% BW peanut paddocks ($P < 0.05$). Goats fed complete ration in the drylot had greater ($P < 0.05$) ADG than goats eating either hay or stover *ad libitum*. Supplementing goats on hardwood range with bermudagrass hay may improve ADG when browse is scarce.

Key words: average daily gain (ADG), crude protein (CP), acid detergent fiber (ADF)

Introduction

During the winter months in north-central Texas, goats often face both forage quantity and/or quality deficiencies since most range forbs and browse are dormant. Goats raised on wooded rangelands depend heavily on browse, especially during winter periods of low-moisture and low temperature dormancy (Lupton et al., 1996). The use of browse by goats is more important where herbaceous forage quality is scarce and does not provide minimal nutrition to support livestock (Sidahmed et al., 1981) and its scarcity may be a production limitation to woodland range-fed goats during the winter months when forages and browse are dormant.

Feeding stockpiled forages such as hay during times of low pasture or range quantity and quality is a common practice among producers in the United States (Horney et al., 1996). Little information, however, is available as to the efficacy of using hays and stockpiled stovers as supplements for goats on winter range dominated by dormant browse species (Villalobos et al., 1997). Supplemental feeding can be more effective during winter months, when forage is scarce and quality is fair to poor precisely when most livestock experience their greatest nutrient demand (Machen, 2001). Supplementing or substituting feed also may attenuate overgrazing impacts on rangelands during the low rainfall months and during temperature extremes. Goat preferences, however, may not be the same when forages are dried and presented as hay (Burns et. al., 2001).

This study evaluated two winter feeding systems for meat goats. One measured nanny kid ADG on hardwood browse supplemented or substituted with bermudagrass hay or peanut stover at three levels (0, 0.5 and 2.0% BW). A second trial

compared a commercially formulated feed to bermudagrass hay or peanut stover fed *ad libitum* a drylot system. The two hays selected for these trials are easily accessible to producers in north-central Texas and are already commonly used by goat producers in the region

Materials and Methods

The trial spanned two 10-week periods, from January to March, in the years 2003 and 2004. The trial site was a native woodland range located at the Texas Agricultural Experiment Station at Stephenville Texas. Trees and brush were primarily post oak, live oak, elm, hackberry, and greenbrier. The 30-year average precipitation for January-March for the area is 6 in. and rainfall for these months during the trial was 5 in. for 2003 and 7 in. for 2004. The 12-acre woodland was divided into ten paddocks, each approximately 1.2 acres, while the drylot area consisted of six pens, each approximately 92 ft² in size. Goats were rotated through each paddock at one-week intervals, allowing each group equal exposure to the same conditions in each paddock. Forage samples were taken by hand plucking, to imitate how the goats would browse the plants, up to the apparent browse line created by the goats.

Sixty-four 5 to 6 month old Boer X Spanish cross nannies were obtained from the same Texas livestock producer each year and averaged 44 lbs at the start of both years. Animals were randomly assigned to sixteen groups of four that were then assigned to either the ten woodland paddocks or six drylot pens. This resulted in a stocking rate of 3.3 nannies/acre (145 lb live weight/acre) at the beginning of the trial, thought to be sustainable at local range production rates. Goats in woodland pens were supplement with 0.0, 0.5, or 2.0% BW of bermudagrass hay or peanut stover.

Animals in the pens were fed *ad libitum* bermudagrass hay, peanut stover, or a complete ration. Goats were allowed a one-week acclimation period prior to initiating supplementation the first week in January. Supplement was given each morning with the refusals collected before giving fresh feed. All treatment groups, including drylot, were provided salt and fresh water *ad libitum*.

Goats were weighed every seven days after which pasture goats were rotated to the next paddock to ensure equal exposure to all pastures. Weekly weights were used to estimate ADG computed as lb of weight gain per head per day per animal. Weekly feeding levels for each treatment were calculated from the mean body weight after each weekly weighing. Feed levels remained at that calculated amount until the following week's weighing and were then re-adjusted. Feed conversion rates were calculated for the pen-fed animals (peanut, bermudagrass, and complete ration).

The effect of supplementation and substitution treatments on ADG and year were assessed via analysis of variance at $P < 0.05$, with two replications of each treatment (four kids per replication) in both trials. Least significant difference (LSD_{0.05}) was utilized to separate multiple treatment means for the ADG and carcass data when appropriate.

Results and Discussion

Hardwood

Cooler temperatures generally produce plants that are higher in quality than plants grown under high temperatures (Ball et al., 2001). Quality indicators for the primary forage species (except leaf litter) in the woodland paddocks (Table 1) followed this general pattern. With goats' strong preference toward woody species (Rodriguez et al., 1998), an attempt was

made to quantify leaf litter from these species since this appeared to be a primary diet component. The quantity of accessible feed ranged up to 80 lb/ac of grasses, 40 lb/ac of oak, and 400 lb/ac of leaf litter over the two seasons. The precipitation over the two trial periods bracketed that of the 30-year average precipitation for January-March for the area.

Table 1. Acid detergent fiber (ADF) and crude protein (CP) concentration of leaves from the main browsed species, peanut stover, bermudagrass hay, and concentrate available to goats during the winter months in Stephenville, TX.

	% ADF	% CP
	Avg.	Avg.
Grass	26.8	15.4
Leaf Litter	46.4	6.4
Oak (<i>Quercus Spp.</i>)	31.2	10.4
Bermudagrass Hay	33.9	12.2
Peanut Hay	36.2	9.9
Concentrate	26.0	18.2

The treatments produced similar results both years: 2% BW peanut stover, 2% BW bermudagrass, and 0.5% BW bermudagrass showed no difference in ADG, but were superior to the 0.5% BW peanut stover treatment and control (Fig. 1). Goats receiving the 0.5% BW peanut stover did not differ from the control. Lack of browse availability, due to season, likely depressed animal performance over the trial period relative to other seasons. Refusal percentages for the 2% BW peanut stover pens and 2% BW bermudagrass pens did not differ. However, the 0.5% BW bermudagrass pen (7%) had greater refusal percentages than did the 0.5% peanut stover pens (4%). The 0.5% BW bermudagrass pen in turn had fewer refusals than did the 2% BW peanut stover (11%) and the 2% BW bermudagrass (12%).

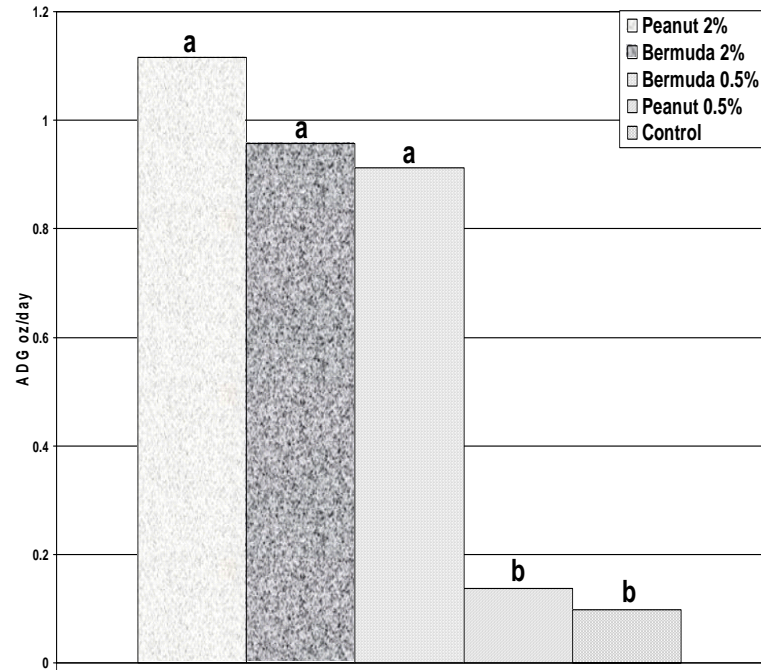


Figure 1. Nanny kid average daily gains (ADG) on winter woodland pastures fed bermudagrass hay or peanut stover at three different rates, expressed as percentage of body weight (values pooled across two years). Columns with different letters differ according to LSD_{0.05}.

Drylot

Year did not affect treatment responses in the drylot study. Sheridan et al. (2003) found that goats have a lower intake of concentrate feed compared to forages, a phenomenon that may lead to their poor performance in a feedlot situation. This did not appear to be the case in our study. On average, goats fed a complete feed ration in the drylot had twice the ADG vis-à-vis goats eating either *ad libitum* bermudagrass hay or peanut stover (Fig. 2; Table 1). Average daily gains of goats fed bermudagrass hay or peanut stover *ad libitum* did not differ.

Refusal percentage was greater in the peanut stover pens (15%) compared to bermudagrass (10%) pens. Goats tend to select forage with the highest nutrient concentration: the leaves more than the stems, the thin stems more than the thick ones (Odo et al., 2001). This may explain the greater refusal percentage in the peanut stover pens since the stover had larger, thicker and less nutritious stems that were likely easier to discard than did the

bermudagrass hay. Although goats in the peanut stover pens tended to consume less, there was no difference in ADG between pens.

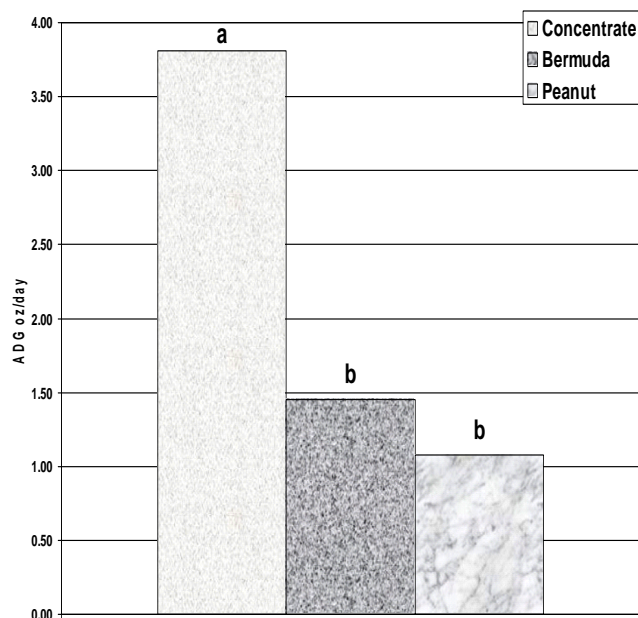


Figure 2. Nanny kid average daily gains (ADG) on winter drylot pens fed complete ration, bermudagrass hay, or peanut stover *ad libitum* (values pooled over two years). Columns with different letters differ according to LSD_{0.05}.

Conclusions/Implications

Kids in our study examining the efficacy of bermudagrass hay or peanut stover as supplements or even complete feeds had generally poor gains, leaving in doubt whether or not the use of bermudagrass hay and peanut stover is effective for goats except, perhaps, in emergency situations. An ounce per day will add only 6 lbs to kids over three months. Since the supplement of bermudagrass at 0.5% BW to range-fed kids produced the same result as greater amounts of hay or stover, this level of supplement would likely be the most efficient. Providing kids with greater amounts of hay or stover, even *ad libitum* in pens, did not improve ADG.

While both hay and stover *ad libitum* in the pens resulted in positive goat ADG, these were only 40% and 30%, respectively,

of the ADG of kids fed the commercial balanced ration. Goats also tended to be more selective (greater proportion of refusals) when fed hay or stover *ad libitum* compared to animals supplemented with the same material in the hardwoods range. In the pen trial, the conversion ratios for peanut stover were 9:1, superior to bermudagrass hay at 10:1. Neither hay nor stover compared, however, to the complete ration which was 4:1. On a price per gain basis, bermudagrass hay cost approximately \$1.10/lb of kid gain while peanut stover cost approximately \$1.00/lb of gain. The concentrate cost was approximately \$0.30/lb of gain. It appears that peanut stover or bermudagrass hay alone may not be the best feed for goats in a winter drylot.

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