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REDUCING AGE AT PUBERTY BY FEEDING MONENSIN OR INCREASING THE PROPORTION OF CONCENTRATES IN THE DIET OF BRANGUS HEIFERS

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SUMMARY

Age at puberty was reduced by 29 days and weight at puberty was reduced by 38 pounds in Brangus heifers fed monensin at the rate of 200 mg per head per day in a diet of 20% concentrates and 80% alfalfa hay or by increasing the proportion of concentrates to 50% of the total diet. Feeding monensin or increasing the percent of concentrates from 20% to 50% of the diet produced similar increases in ruminal propionic acid and similar reductions in ruminal acid. This study shows that age at puberty can be reduced by altering ruminal fermentation enough to significantly increase the percentage of heifers calving at two years of age.

OBJECTIVES

The primary objectives of this trial were:

1.) To demonstrate that increasing the proportion of concentrates to 50% of the diet would mimic the ruminal fermentation patterns of similar heifers fed monensin in a diet containing 20% concentrates and 80% alfalfa hay.

2.) To demonstrate that increasing ruminal propionate levels by either feeding monensin or by feeding higher concentrate levels would result in a reduction in age and weight at puberty in heifers of equal age, weight and rate of gain.

PROCEDURE

Feeding Trial

Ninety purebred prepuberal Brangus heifers of known age and weight at weaning with a mean age and weight of 316 days and 533 lbs were stratified according to weight per day of age and randomly allotted to one of two replicates in each of three treatments. Treatments were control (C) containing 80% alfalfa hay and 20% concentrates, monensin (M) which was the same as C plus 200 mg monensin per head per day and a higher energy diet (HE) which contained 50% alfalfa hay and 50% concentrates. Diets

were formulated and fed at levels to provide equal daily crude protein intake and to produce equivalent live weight gains of approximately 1.30 lb per animal per day. The controlled daily feed was fed once daily and feed consumption recorded daily by replicates. Live weights were taken periodically during the 157 day trial. The feeding trial portion of the study was terminated on day 157. Rumen samples were taken via stomach tube and were assayed for total volatile fatty acids (VFA), using procedures of Erwin et al. (1961). Rumen samples taken on day 80 were taken at 3, 5 and 7 hours post feeding to determine uniformity of VFA response over that time period.

Puberty Study

A sterile bull equipped with a chin ball marker was placed with each replicate in each treatment group and the heifers were observed for estrus twice daily. Age at puberty was recorded as age at which a heifer accepted the service of the bull accompanied by evidence such as vaginal mucous discharge and swelling of the vulva. Heifers observed to be in estrus were bred artificially or were hand mated to a fertile Brangus bull. Weight at puberty was extrapolated from the live weights immediately preceeding and following the puberal estrous. Any heifer which did not attain puberty during the feeding trial portion of the study was kept on their experimental treatment until they reached puberty. All heifers were examined for pregnancy by rectal palpation 60 days after the last heifer attained puberty. Services per conception were recorded as the number of inseminations per pregnancy determined by rectal palpation 60 days after the last mating. All heifers were subjectively scored for body condition or fatness (1 = very thin; 10 = very fat) at the beginning of and on day 157 of the trial.

RESULTS

Table 1 shows actual amounts of concentrate and hay fed and the estimated intake of protein and energy. All diets were well above requirements for all nutrients. Energy intake and protein intake was slightly higher for C than for M or HE heifers. Table 2 shows the weights and gains for the three treatment groups. Although the C animals consumed more metabolizable energy (ME) than either M or HE and gained slightly more, the difference in average daily gain (ADG) was not

significant (P>.10). The data in table 2 indicate that none of the treatments differed significantly with respect to initial and final weights or with respect to live weight gain.

Since treatments were successfully fed to achieve similar rates of gain in heifers of equal age and initial experimental weight, and since the age and weight at puberty were similar for M and HE groups, these two groups were pooled and compared to C for combined treatment effect on age and weight at puberty (table 3). Using these comparisons there was no difference (P>.05) between C and M + HE with respect to weaning age, weaning weight, initial experimental weight, final experimental weight, ADG, initial condition score and final condition score. There was, however, a significant (P<.009) difference in the age at puberty with C having a mean age at puberty of 514 days and M + HE having a mean of 485 days, a difference of 29 days. Weight at puberty was likewise significantly (P<.03) reduced when C was compared to M + HE. Mean weight at puberty was 733 for C and 695 for M + HE combined. Mean services per conception were 1.28 for C and 1.53 for M + HE. M + HE tended (P<.08) to require more services per conception than C.

Table 1. Daily intake of concentrates and alfalfa hay and estimated intake[1/] of crude protein, metabolizable energy, Ca, P, K and Mg.

Treatment	C	M	HE
Concentrate, lb	3.22	3.02	6.86
Alfalfa hay, lb	14.66	12.04	6.86
C. protein, lb	2.84	2.38	2.38
ME, megcal	15.93	13.50	14.16
Ca, gm	127.98	105.22	61.88
P, gm	39.47	31.50	26.35
K, gm	102.02	84.40	85.08
Mg, gm	17.79	14.89	16.61

[1] Estimated from NAS (1971).

Table 2. Effect of C, M, and HE on feedlot gain and efficiency during the 157 day feeding period.

Treatment	C	M	HE
Initial weight, lb	532[a]	534[a]	543[a]
Final weight, lb	755[a]	743[a]	756[a]
Gain, lb	224[a]	209[a]	213[a]
ADG, lb	1.43[a]	1.33[a]	1.36[a]
Feed intake, lb	17.68	15.06	13.71

Table 2. Continued..

Treatment	C	M	HE
Feed/gain	12.33	11.38	10.01
ME intake, megcal[1]	15.93	13.50	14.16
ME/kg gain, megcal[1]	11.14	10.23	10.41
Percentage of control	100.00	91.83	93.45

[a] Values on the same line bearing common superscripts are not different (P>.10).

[1] Estimated from NAS (1971).

Table 3. Effect of C, M and HE on age and weight at puberty.

Treatment	C	M	HE
Age at puberty, days	514.3	489.9	479.2
Wt at puberty, lb	733	694	697
Services per conception	1.28	1.62	1.65
Initial condition score	3.90	3.66	3.81
Final condition score	7.15	7.15	7.44

This study justifies the following observations. (1) Feeding monensin in an 80:20 roughage:concentrate diet reduced the feed required per pound of gain by 7.70 percent and feeding a 50:50 roughage:concentrate diet containing micronized milo reduced the feed required per pound of gain by 18.8 percent. (2) Age at puberty was reduced by 29 days and weight at puberty was reduced by 38 lbs in Brangus heifers by two different treatments when applied to heifers whose ages and pre-experimental growth rates and condition scores were equalized by design.