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EFFECT OF BY-PASS PROTEIN ON GROWTH AND REPRODUCTIVE TRAITS OF BRAHMAN BULLS

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Background. Different protein sources have different effects on liveweight gain of growing cattle. Research has shown that fishmeal (FM) in the diet increased growth rates and feed efficiency of beef calves. This positive response has been attributed to the high ruminally undegradable protein (by-pass protein) content of fishmeal, that results in an increased flow of essential amino acids to the small intestine. Rations containing by-pass protein have been reported to have some beneficial affect on testicular and epididymal function of postpuberal bulls, but its effects on developing bulls have not been assessed. Brahman bulls have lower growth rates and mature later than *Bos taurus* bulls. The objectives of this experiment were to determine the effects of a ration containing by-pass protein on growth rate, feed efficiency and reproductive development of Brahman bulls.

Research Findings. Thirty-nine Brahman bulls were randomly allotted to one of two treatment groups. The control (C) treatment consisted of a ration containing 81.7% corn, 16.3% soybean meal and 2% dicalcium phosphate. The fishmeal treatment (FM) consisted of a ration with 87.5% corn and 12.5% fishmeal (Sea-Lac, Zapata Haynie Corporation). The rations were isocaloric and isonitrogenous. For an 84-day period the bulls were fed at 1% of their average body weight. After the first 84-days, intakes were increased to 1.25% of average body weight. Coastal bermudagrass hay, water and minerals were available free choice. Body weight and scrotal circumference were measured at 14-day intervals. Bulls were electroejaculated after reaching 12-months of age, and at 14-day intervals thereafter. In a randomly pre-determined order, bulls in each treatment were castrated when the first ejaculate with first motile sperm cells (Stage 1, n=11), 10 to 25x10⁶ (Stage 2, n=9), ≥ 50x10⁶ (Stage 3 - puberty, n=10) sperm cells were obtained. Immediately after castration the epididymis was separated from the testicle in both organs were weighed and frozen at -20C. Parenchyma from the right testicle was later homogenized (\pm 1.5 g) to estimate daily sperm production per testicle (DSP), and daily sperm production/g of parenchyma (DSPG). Average body weights at the beginning of the 84-day period were 454.0 \pm 7.8 and 447.1 \pm 7.3 lb for C and FM, respectively. Fishmeal-fed bulls had higher (P<0.01) average daily gain (FM=2.2 \pm 0.04 lb, C=1.9 \pm 0.06 lb) and greater (P<0.05) feed efficiency (FM=7.7 \pm 0.3 lb, C=8.7 \pm 0.3 lb feed:lb gain) than the C bulls. Body weight after 84-days on test was numerically greater in FM than in C bulls (627.6 \pm 7.3 vs 612.1 \pm 10.7 lb). Days

from first sperm to puberty did not differ between control (38.9±7.7) and fishmeal (43.6±8.3) bulls. Data on weights, age and scrotal circumference size of the bulls, at different stages of development are presented in table 1.

Table 1. Mean age, weight and scrotal circumference of C and FM bulls at first sperm cells and at puberty.

Treatment	Age at 1st Sperm (days)	Age at Puberty (days)	Weight at 1st Sperm (lb)	Weight at Puberty (lb)	SC at 1st Sperm (cm)	SC at Puberty (cm)
C	428.8±8.0 ^a	462.3±12.9 ^a	675.3±22.2 ^a	738.4±36.4 ^a	26.6±0.7 ^a	28.5±0.7 ^a
FM	436.2±10.4 ^a	473.3±21.7 ^a	751.7±26.6 ^b	794.5±63.9 ^a	27.1±0.6 ^a	29.6±1.5 ^a

^{a,b}Means with different superscripts are statistically different (P<0.02).

Daily sperm production, DSPG, testicular weight (TWT) and parenchyma weight (PWT) were not affected by treatment. Fishmeal-fed bulls had heavier (P<0.01) epididymis (6.6±1.0 g) than soybean meal-fed bulls (3.9±0.6 g). Daily sperm production was 115.2±0.1×10⁶, 447.4±0.1×10⁶, 792.7±0.1×10⁶, and DSPG was 1.5±0.5×10⁶, 3.2±0.6×10⁶ and 64.0±0.6×10⁶ for bulls at Stages 1, 2 and 3, respectively. No significant correlations were found between epididymal weights and DSP, DSPG, TWT or number of sperm cells per ejaculate. There were significant (P<0.01) positive correlations between TWT and DSP (r=.68), sperm cells in the ejaculate and DSPG (r=.63) and between sperm cells in the ejaculate and DSP (r=.48)

Application. The findings of this study indicate that bulls receiving by-pass protein grew more rapidly and more efficiently (14%) than bulls fed soybean meal. However, at present day prices, feeding FM to growing Brahman bulls may not be a cost effective procedure. Increasing the quantity of ruminally undegradable protein in the ration was not effective in improving testis growth, testicular function or sperm production. Further studies are necessary to clarify the effects of by-pass protein on epididymal function. Electroejaculation was a good method to predict daily sperm production in peripubertal bulls.