environment and effect of different supplementation strategies for developing heifers grazing winter range at the Corona Range and Livestock Research Center, Corona N.M. In the first experiment, fifty-five Angus cross replacement quality heifers were stratified by weaning weight, allocated to one of four replicated pastures, and randomly assigned one of two supplemental treatments: 2 lb/d of a control (C) supplement consisting of .72 lb/hd/d crude protein CP with .28 lb undegradable intake protein UIP (n=28), or 2 lb/d of a bypass supplement (BP) consisting of .73 lb/hd/d CP with .36 lb UIP (n=27). Also, twenty-nine lightweight Angus cross non-replacement quality heifers were given 4 lb/hd/d of a energy supplement (E) consisting of .72 lb/hd/d CP with .28 lb UIP + .22 lb propionate salt (NutraCal™, Kemin Industries, Inc.; n=29), and allocated to one of two replicated pastures adjacent to pastures containing the C and BP treatments. Initially, heifers were weighed November 23, 1998, and monthly 12 h shrunk weights obtained from January to April 1999. Diet samples collected at the beginning and end of the study provided 80 and 79% NDF, 5.2 and 7.7% CP, 50.1 and 51.5% forage 96 h in-situ digestibilities, respectively. Average daily gain (ADG) throughout the study was similar for heifers fed C, BP, and E (.44, .33, and .53 lb/d, respectively). Weight gain was greater for E fed heifers between February and March (.06, .33, and .75 lb/d for C, BP, and E, respectively). The cost of supplements per animal for 180 days on feed was ($42.88, $61.67, and $95.73) for C, BP, and E supplements, respectively. In experiment 2, eight ruminally cannulated heifers receiving BP and E were fed individually, and VFA concentrations were measured over one supplementation interval 48 h. Samples obtained over this sampling interval revealed increases in propionate, acetate, and butyrate in the E fed heifers suggesting that overall energy availability may have been improved. The increase in propionate provided by the E treatment may have increased insulin sensitivity stimulating glucose uptake in peripheral blood; therefore, improving nutritional status of the animal. Diet quality estimates indicated that dormant winter range does not satisfy the nutrient requirements of developing heifers and that different supplements may alter the pattern of body weight change by altering absorbed products.

Changing the Ratio and Amount of Bypass Protein Fed to Young Range Cows Changes the Efficiency of Supplement Utilization

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Key Words: Range cows, Bypass protein, supplementation

Feeding protein supplements high in bypass protein has been reported to improve range cow productivity in some cases, but not in others. A study was conducted at the Corona Range and Livestock Research Center 13 km east of Corona, NM in an effort to determine an optimal amount and proportion of bypass protein can improve production from young postpartum cows. During the spring of 1998 and 1999, 2 and 3 yr old postpartum cows were fed one of three protein supplements individually at a rate of 2 lbs. per head per day. The supplements were formulated to provide either 0.75 lb/d crude protein (CP) with 0.25 lb of bypass protein (LOW), 0.75 lb/d crude protein with 0.375 lb bypass protein (MID), or 1.12 lb/d crude protein with 0.75 lb bypass protein (HIGH). Supplements were fed for an average of 75 d in 1998 and for 60 d in 1999. Average cost of supplementation per cow was $20.03, 21.00, and 26.93 in 1998 and $16.02, 16.80, and 21.54 in 1999 for LOW, MID, and HIGH respectively. In both years, 3 yr old cows produced more milk and heavier calves. During 1998, cows fed MID and LOW tended (P=.22) to produce less milk than cows fed HIGH. Cows fed HIGH during 1998 also tended to have higher average daily gain from the lowest body weight until the end of breeding, but cows fed MID and LOW used supplement more efficiently, converting a higher proportion of supplemental nutrients into body weight gain over this period. Adjusted 205-d weaning weights of calves were similar in 1998 for cows fed all three supplements. During 1999, all cows produced more milk than in 1998. Cows fed MID tended to produce less milk (11% less than LOW, 17% less than HIGH). Cows fed MID had greater ADG than cows fed LOW, but were similar to cows fed HIGH. The reduction in milk production and improvement in cow weight gain did not affect calf weaning weight, as calves from cows fed MID and HIGH had 25 lb. greater adjusted 205-d weaning weights than those from cows fed LOW. Again, the efficiency of protein use was higher in cows fed MID, since they were fed less total protein than cows fed HIGH. In general, a supplement providing a smaller amount of total protein with a higher ratio of bypass protein improved the metabolic and economic efficiency of production when fed to young range cows. Adding more bypass protein

to this supplement may improve total calf production in some years, but this advantage occurs at a lower efficiency of supplement utilization.

Relative Efficiency of 40 or 160 G of Moderate or High UIP Supplemental Protein with Low Quality Forage Diets

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Key Words: protein, supplementation, efficiency

A study comparing the relative efficiency of supplement utilization among different amounts of two protein sources, based on in situ forage DM disappearance, ruminal ammonia and serum urea nitrogen (SUN) accumulation, serum glucose, and N concentration in duodenal contents, was conducted using a 4X4 Latin Square. Four dually cannulated steers were restricted to 15 lb/d sudan hay (3.7% CP) in addition to 2 oz. salt-mineral (CON), CON+0.1 lb CP from cottonseed meal (LCS), CON+0.4 lb CP from cottonseed meal (HCS) or CON+0.1 lb CP from a blood and feather meal combination (BFM) during 14 d periods. In situ DM disappearance after 24 h was greater in supplemented animals (P<.1), but was similar for BFM compared to HCS or LCS (P>.2). Disappearance was 35.4, 39.5, 37.3 and 37.2±1.1% for CON, HCS, LCS, and BFM. Ruminal ammonia concentrations were influenced by supplementation (P<.05). HCS induced greater ruminal ammonia accumulation than BFM (P<.01) while BFM and LCS resulted in similar ammonia concentrations (P>.2). Serum urea nitrogen concentrations followed a trend reflecting ruminal ammonia. SUN was influenced by supplementation (P<.01), with HCS increasing SUN more than BFM (P<.02) and LCS and BFM exerting similar effects (P>.4). Serum glucose concentrations were increased with protein supplementation (P<.01) but did not differ among supplemental treatments (P>.2), indicating that more gluconeogenic precursors were available when additional protein was provided. Concentration of N in duodenal contents was increased by supplementation (P=.06), with no statistical difference observed between supplements (P>.4). Nitrogen concentrations in duodenal contents (% N in wet contents) were .069, .087, .079, and .086 ± .006 for CON, HCS, LCS, and BFM. In conclusion, 0.1 lb of supplemental protein improved utilization of low quality forages. The marginal response to an additional 0.3 lb of protein was diminished. These data suggest that due to improved efficiency, low levels of supplement may be as effective as higher amounts when fed with low quality forages.