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Adjusting protein in cattle rations during cold weather

Abstract

Two winter trials have indicated that protein can be removed from growing rations during cold weather without lowering average daily gain. Cattle consumed 0.29 and 0.33 lb/hd/da (0.11 and 0.15 kg/hd/da) less protein supplement (soybean oil meal) during winters 1975 and 1976, respectively.

Keywords

Cattlemen's Day, 1976; Report of progress (Kansas State University. Agricultural Experiment Station); 262; Beef; Protein; Rations

Adjusting Protein in Cattle Rations During Cold Weather[1]

D. R. Ames

Summary

Two winter trials have indicated that protein can be removed from growing rations during cold weather without lowering average daily gain. Cattle consumed 0.29 and 0.33 lb/hd/da (0.11 and 0.15 kg/hd/da) less protein supplement (soybean oil meal) during winters 1975 and 1976, respectively.

Introduction

Exposure of feedlot cattle to effective temperature below the animal's thermal neutral zone (TNZ) increases net energy it needs for maintenance (NEm). Increased intake during cold weather does not fully compensate for increased NEm, so available net energy for growth (NEg) is lowered. Consequently, when protein percentage in rations is constant during cold weather protein efficiency (g protein/g gain) is reduced. Logically, protein efficiency could be improved by matching protein in the ration to gain during cold. Previous work shows that mean daily temperature (MDT) can be used to predict average daily gain (ADG).

Procedures

Two trials were conducted to test the idea that protein could be adjusted during cold without affecting gain. During winter 1974-75, 200 steers were fed protein levels adjusted for cold, while 200 control steers were fed a 12.5% crude protein ration. In winter 1975-76 a 2x7 factorial design was used to compare constant protein ration with adjusted-protein rations. Protein adjustments were based on lowered ADG expected during cold weather. The formula, gain = 1.396 + 0.013 C where gain is kilogram and C is temperature in degrees centigrade was used to predict gain during cold. That equation was derived from data involving approximately 40,000 steers fed outdoors in Kansas. Protein for growth (protein above maintenance being $2.79W^{0.75}$ gram) was adjusted according to the expected effect of temperature on gain. For example, when gain was predicted to be lowered 25%, then, protein for growth was reduced 25%. All protein adjustements were made by replacing protein supplement (SBM) with milo so that rations would contain the same calories as with SBM. No attempt was made to lower protein more than removing all supplement.

[1] Supported by Fourth National Bank of Wichita through Livestock and Meat Industry Council.

Results and Discussion

Both years ADG did not differ ($P<.05$) between steers consuming a constant-percentage-protein and those receiving protein adjusted for expected lower ADG during cold. Steers ate 0.29 and 0.33 lb/hd/da (0.11 and 0.15 kg/hd/day) less protein supplement (SBM) for the trial 1 and trial 2, respectively (table 11.1). It must be emphasized that protein removal is limited to supplemental protein feedstuffs and that some rations contain more protein than needed during severe cold. Practically, it is not feasible to remove protein beyond that included in supplemental protein.

Adjusting protein is more important in growing rations than in finishing rations because lean tissue deposition is greatest during earlier stages of growth. Consequently, both trials involved growing rations and relatively light cattle, 475 and 670 lbs. (215 kg and 303 kg) initial weight for trial 1 and 2, respectively.

The idea of altering rations to match environment is a relatively new concept which should maximize efficiency by reducing feed cost. Adjusting protein will improve protein efficiency (grams gain/grams protein intake) because excess dietary protein for growth is withdrawn instead of being used as a source of energy during cold. The technique of altering rations to match environments will be refined as more is learned about environmental effect on animal performance.

Table 11.1 Effect of adjusting protein to expected ADG of growing steers.

Trial	% Crude Protein	ADG (lb)	SBM Removed lb/hd/da
Control 1 (117 days)	12.5	2.07 (0.99 kg)	0
Adjusted 1 (117 days)	variable	2.06 (0.99 kg)	0.29 (0.11 kg)
Control 2 (87 days)	11.9	2.39 (1.06 kg)	0
Adjusted 2 (87 days)	variable	2.93 (1.10 kg)	0.33 (0.15 kg)