

Fall Gains of Steers Fed Cottonseed Cake on Shortgrass Range¹

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Highlight

Cottonseed cake, fed to steers in the fall, increased the efficiency of forage utilization but did not produce sufficient additional gain on shortgrass range to be economically feasible.

The 28-year (1940–1967) average gain per head for yearling cattle on shortgrass range at Central Plains Experimental Range during the month of October was 14 pounds. Daily gains customarily dropped from 1.14 pounds in September to 0.45 pound in October, yet the energy value of the forage remained high. Hyder (1967) at-

tributed this drop in daily gain to a lower forage intake by cattle during October. He suspected the low crude protein contents of the forage to be the cause of this low forage intake. In 1967 a protein supplement study was conducted to test this assumption.

Methods

The study was conducted on a half-section pasture at Central Plains Experimental Range located 38 miles northeast of Fort Collins, Colorado. Klippel and Retzer (1959) described the soil as a sandy loam belonging to the Ascalon series. Blue grama (*Bouteloua gracilis* (HBK) Lag. ex Steud.) is the primary herbage species. The 29-year (1939–1967) average annual precipitation at the experimental site was 12.23 inches with an average of 9.03 inches during the period

May 1 to September 30. Total annual precipitation has varied from a low of 4.31 to a high of 22.88 inches. Average annual wind velocity was 6.4 miles per hour. Mean high and low temperatures during the period May 1 to September 30 were 78F and 47F, respectively. The average frost-free period was 135 days.

Twenty yearling Hereford steers, furnished by the Crow Valley Livestock Cooperative, were used to graze the pasture from June 12 through October 29. The steers were weighed at 2-week intervals after a 15-hour overnight shrink. The amount of forage consumed daily by the grazing cattle was determined by using the water-intake method of Hyder et al. (1966). Forage quality, expressed in terms of dry matter conversion rate, was determined for each 2-week period by dividing average daily forage intake by average daily gain.

Winter feeding studies at Central Plains Experimental Range show that it takes approximately two weeks to get long yearling cattle up to a daily intake of two pounds of cottonseed cake. For this reason

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the caking program was started prior to the expected October drop in daily gain. On September 18, the herd was divided into 2 groups of 10 steers each. Steers were randomly selected for this division. One group was fed cottonseed cake containing 41% crude protein, and the other group received no supplement. The cake was weighed and fed to steers in individual watering pens when the herd came in for water. Steers not receiving cake watered at a set of waterers in a small corral adjacent to the individual pens. All 20 steers grazed together and were separated only when at water. Large plastic ear tags were used to identify those steers receiving cake. After a few days on this schedule the steers receiving cake moved readily to their individual pens while the other steers waited for the gate to be opened into their watering area. Water drunk was measured for each group and dry-matter intake calculated. Dry-matter conversion rates were determined to evaluate the protein supplement fed during three 2-week periods in the fall. Analysis of variance was computed for animal gains and t-tests were made for dry-matter intake and dry-matter conversion rates.

The study was terminated October 30 and the steers were sold at auction on the Greeley, Colorado, market November 7.

Results

Dry-matter intake by the 20 grazing steers averaged 24 lb/head/day for the period from June 12 through September 17, and for the 10 steers receiving no supplement, dropped to 16 lb/day during the period from September 18 through October 29.

Each of the 10 steers receiving protein supplement was offered three pounds of ½-inch cottonseed pellets daily. During the period September 18 through October 1, they took only 1.2 lb/head/day supplement, oven-dry (Table 1). During the next two periods their daily intake of pellets increased to 2.2 and 2.4 lb, respectively. Total dry-

Table 1. Average dry-matter conversion to gain by yearling Hereford steers, with and without protein supplement, during the fall of 1967 on shortgrass range.

	9/18-10/1		10/2-10/15		10/16-10/29	
	With	Without	With	Without	With	Without
Dry matter eaten (lb/head/day) ¹	17.3	15.4	17.8	15.6	18.5	15.7
Supplement eaten (lb cottonseed cake 41% crude protein/head/day)	1.2		2.2		2.4	
Forage eaten (lb/head/day)	16.1	15.4	15.6	15.6	16.1	15.7
Gain (lb/head/day)	2.00	2.36 ²	1.29	0.64 ³	1.14	0.50 ³
Dry-matter conversion rate (lb DM/lb gain)	8.65	6.53	13.80	24.38	16.23	31.40

¹Determined by the water intake method.

²Period means not significantly (.05) different.

³Period means significantly (.05) different.

matter intake was estimated with the water-intake method, and the weight of supplement eaten was subtracted to estimate forage intake by the steers receiving cottonseed cake. Differences in the estimated amounts of forage eaten by the steers, with and without protein supplement, are not significant.

Daily gains of 2 lb or more during the first 2-week period were higher than the 1.14 lb expected in September for steers with no supplement. This may have been due to the legume, *Psoralea tenuiflora* Pursh, which was sought out and grazed by all the steers from September 20 through September 27. Daily gain by the steers receiving no supplement exceeded that of the steers eating the cake.

Average gain during the month of October for the steers receiving no cottonseed cake was 16 lb/head. Comparison of this gain with the 28-year average October gain of 14 lb/head indicates the similarity of the forage available for this study and the forage usually available in October. Daily gains in October, during the second and third periods, dropped as expected (Table 1). Daily gain of the steers without supplement dropped 73% and 79%, respectively, while daily gain of steers with supplement dropped

only 36 and 43%, respectively. Steers receiving the cottonseed cake averaged over twice the gain of steers without the supplement.

Dry-matter conversion rates differ between periods and treatment in a manner opposite to that of animal gains. Since the supplement increased as well as decreased the conversion rate, a two-tailed test was used in the t-test. The computed t-value of 2.43 indicates that the differences are significant at the .08 level of probability.

During the 6 weeks of the protein supplement part of this study, the steers receiving cottonseed cake averaged a 13-lb gain above those not receiving the cake. The 10 supplemented steers consumed an average of 81.2 lb of cake, which, at \$96.00 per ton, cost \$3.90 per head. The cost of the cake per pound of gain attributed to the supplement was \$0.30. The twenty steers from this study sold on the Greeley market November 7 for \$25.15/cwt.

Discussion and Conclusions

The characteristic low forage intake by cattle in October was not increased by feeding cottonseed cake. However, this protein supplement did enable the steers to make more efficient use of the forage consumed. Additional information is

needed on the quantity of Cottonseed cake required to produce this more efficient use of the forage. Other types of protein supplement such as dehydrated alfalfa should also be tested. If the same results could be obtained with less than two pounds of cottonseed cake per day, the time required to bring the cattle to a lower supplement intake would be reduced. Both these factors could lower the amount of the supplement required. A certain amount of time is required to enable the microflora of the rumen to adjust to the changed diet. The adjustment period required for different types of protein supplement should be determined, and the sup-

plement feeding started in sufficient time for the microflora to have completed their adjustment to the new diet by October 1.

In this study the cost of the cake, not considering the cost of labor required to feed it, was not recovered in the sale price of the cattle. In view of the characteristic low October gains and the customary decline in late October and early November feeder cattle prices, cattle for the market should either be sold from shortgrass ranges by late September or early October or supplemented with protein.

A decision to supplement with cottonseed cake, as fed in this study, should be based on the current

price of cottonseed cake in relation to expected feeder cattle prices and gains.

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