BYPASS PROTEIN SUPPLEMENTATION OF STOCKER CATTLE ON WHEAT PASTURE

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Story in Brief

A 92-day trial using 80 fall-weaned steer calves (502 lb average initial weight) was conducted to evaluate the effects of supplemental protein supplied as mechanically produced cottonseed meal or corn gluten meal on weight gains of growing steers grazing wheat pasture. Cattle received no supplement or were fed 2 lb/head of either a corn-based energy supplement (8.6% crude protein on a dry matter basis) or protein supplements that contained 20.2% crude protein and 31% cottonseed meal or 20.5% corn gluten meal. Weight gains were increased about .3 lb/day irregardless of type of supplement. Supplements containing additional high bypass protein did not increase gains compared with the corn-based energy supplement.

(Key Words: Wheat Pasture, Protein, Supplementation, Growing Cattle.)

Introduction

Wheat forage commonly contains 20 to 30% crude protein on a dry matter basis. However, large amounts of soluble nitrogen (N) and soluble non-protein nitrogen (NPN) are present in the crude protein fraction (Johnson et al., 1974; Horn et al., 1977). Because of the rapid rate of degradation of wheat forage N in the rumen and loss of ammonia-N that is not incorporated into microbial protein, performance of rapidly growing cattle on wheat pasture may be decreased by inadequate flow of protein to the small intestine (Beever, 1984; Vogel et al., 1987). Results of previous studies to determine the effect of feeding additional supplemental protein of low ruminal degradability on weight gains of stocker cattle grazing wheat pasture were reported by Horn et al. (1989) and Vogel et al. (1989). Protein sources used in the previous studies were meat meal, meat and bone meal or cottonseed meal (produced by the mechanical process). An additional study using mechanically produced cottonseed meal and corn gluten meal as the protein sources are reported herein.

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Materials and Methods

Eighty Hereford and Hereford x Angus fall weaned calves that weighed 502 lb were randomly allotted by weight within breed groups to four treatments. A randomized complete block design with two replications was used. The trial was conducted at the Forage and Livestock Research Laboratory (USDA/ARS) in El Reno, Oklahoma. The steers were vaccinated for IBR, BVD, PI3 and 7-way Clostridium, treated for internal and external parasites and implanted with Ralgro. The steers grazed wheat pasture (TAM 101) at a stocking density of 2 acres/head from December 8, 1988 to March 10, 1989 (92 days). The wheat pasture was produced by minimum tillage and received 80 lb of N/acre. Cattle of Treatment 1 received no supplement (other than free-choice access to a commercial mineral mixture) while those of Treatments 2, 3 and 4 were fed daily 2 lb/head of a corn-based energy supplement or supplements that provided additional protein from cottonseed meal (mechanical process) or corn gluten meal. Composition of the supplements is shown in Table 1. The energy and protein supplements contained, respectively, 8.6 and 20.2% crude protein (CP) on a DM basis. The supplements were isocaloric, contained equivalent amounts of calcium, phosphorus and magnesium and provided 150 mg monensin/head/day. Because of the relatively mild winter, no hay was fed to the cattle during the trial.

The steers were weighed after an overnight shrink of about 16 h in drylot. Data were analyzed by least squares analysis of variance. In addition, orthogonal contrasts were conducted to test the following effects: 1) no supplementation vs supplementation, 2) energy vs protein supplementation and 3) cottonseed meal vs corn gluten meal supplementation.

Results and Discussion

Mean initial and final weights of the cattle, daily gains for the entire 92-day trial and supplement conversions are shown in Table 2. Consumption of the supplements was good and it was never necessary to measure any refusals. Daily gains of the cattle were increased ($P<.03$) about .3 lb by supplementation. The cottonseed meal or corn gluten meal supplements did not increase ($P>.50$) gains compared to the corn-based supplement, nor did source of supplemental protein influence gains. These results are similar to those reported by Horn et al. (1989) and Vogel et al. (1989) in which cottonseed meal, meat and bone meal and meat meal were used as the sources of high bypass protein.

Ruminal degradability of feedstuffs varies with type of diet and level of feed intake (Zinn and Owens, 1983; Goetsch and Owens, 1985). Vogel et al.

Table 1. Composition of supplements (DM basis) fed to steers.

Item	Corn %	Cottonseed meal[a] %	Corn gluten meal[b] %
Corn, ground	77.80	53.05	56.57
Cottonseed meal		31.44	
Corn gluten meal			20.53
Cottonseed hulls	5.98	.36	6.81
Dehydrated alfalfa	4.00	4.00	4.00
Sugarcane molasses	4.20	4.20	4.20
Dicalcium phosphate	3.95	2.37	3.72
Calcium carbonate	2.74	3.51	2.84
Magnesium oxide	.45	.20	.46
Salt	.45	.45	.45
Trace-mineralized salt	.30	.30	.30
Rumensin 60 Premix[c]	.13	.13	.13
---------- Nutrient composition ----------			
Crude protein, %	8.64	20.20	20.20
Calcium, %	2.00	2.00	2.00
Phosphorous, %	1.00	1.00	1.00
Magnesium, %	.40	.40	.40
NE_g, Mcal/lb	.56	.56	.56

[a] Produced by mechanical process. Traders Oil Mill, Fort Worth, TX.
[b] American Fructose, Dimmitt, TX.
[c] Supplied 75 mg monensin/lb (as-fed).

(1988) and Vogel (1988) characterized ruminal N degradation of several high protein feedstuffs in cattle grazing wheat pasture. Ruminal N degradation of cottonseed meal produced by the mechanical process was 49% and was less than 66% for cottonseed meal produced by direct solvent extraction. Ruminal degradabilities of meat and bone meal and meat meal were 44 and 52%, respectively.

Calculated supplement conversions in this trial were 7.3, 5.5 and 8.0 lb of supplement (as-fed) per lb of increased gain for cattle fed the energy, cottonseed meal and corn gluten meal supplements, respectively (Table 2). Differences among treatments were not significant ($P > .45$).

Lee (1985) reported that weight gains of calves grazing wheat pasture and fed 1.5 lb/day of a supplement containing 15% meat meal were increased .2 lb/day as compared with a control, hominy feed-based

Table 2. Effect of protein supplementation on performance of growing steers on wheat pasture.

	Supplement				
	Control	Energy	Cottonseed meal[a]	Corn gluten meal	SE
Number of cattle	20	20	20	20	
Supplement consumption, lb/head/day	0	2	2	2	
Initial weight, lb	503	497	501	504	13.5
Final weight, lb	726	745	758	755	15.0
Daily gain (92 d), lb	2.42[b]	2.69	2.79	2.72	.06
Supplement conversion[c]		7.3	5.5	8.0	1.88

[a] Produced by mechanical extraction.
[b] No supplement vs supplement ($P<.03$).
[c] Lb of supplement (as-fed) per lb of increased gain. Differences among treatments are not significant ($P>.45$).

supplement. Anderson et al. (1987) reported a similar gain response by stocker cattle grazing wheat pasture and fed 1.5 lb/head/day of a supplement that contained 11.5% feather meal and 19.4% meat and bone meal. Our studies are not in agreement with these studies. Differences in amounts of available wheat forage, the number of days of snow and(or) ice cover and amounts of other supplemental feeds that were fed may account for part of the discrepancy of results. In the study of Anderson et al. (1987), cattle had free-choice access to wheat hay throughout the 79 days of grazing wheat pasture and free-choice access to corn silage during 21 days of the trial when snow cover "inhibited grazing." This fairly high level of supplementation with wheat hay and corn silage would favor a response to additional supplemental protein.

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