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 CLAYTON LIVESTOCK RESEARCH CENTER

PROGRESS REPORT

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Roughage Source and Level in Whole Shelled Corn Diets for Growing/Finishing Beef Heifers

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Processing corn by heat and(or) moisture methods improves starch utilization and generally enhances feed efficiency. Feeding whole corn reduces processing costs, but feed efficiency is typically superior for processed corn diets than for whole corn diets. In an effort to understand factors affecting utilization of whole corn-based diets, we evaluated effects of three roughage sources on performance of growing/finishing beef heifers fed either 85 or 92.5% concentrate, whole shelled corn diets.

Two hundred twenty-eight crossbred (British x Brahman) heifers were used in a completely random design with a 2 x 3 factorial arrangement of treatments. Factors were roughage level (either 7.5 or 15% of dry matter) and roughage source (alfalfa, sorghum sudangrass hay or cottonseed hulls). Ingredient composition of the six treatment diets is shown in Table 1. Alfalfa (field cubes) and sorghum sudangrass (large round bales) were ground (1-in screen) before mixing into diets. All heifers were implanted with Synovex H¹ and weighed on September 5, 1990, and assigned randomly to one of the six diets. After a second body weight (BW) measurement on September 6, 1990, heifers were sorted to 12 pens with 19 heifers per pen. Initial BW was the average of measurements on the two days. The experiment was terminated by weighing the heifers on days 69 and 70. Two heifers were removed from the experiment (one leg injury and one vaginal prolapse).

Heifers were fed once daily in quantities sufficient to allow free choice consumption. Diet samples were taken weekly to determine dry matter (DM) content, ground and analyzed for chemical constituents (Table 2). Data were analyzed to test for effects of roughage level, roughage source and the interaction of roughage level and source.

No interactions of roughage level and roughage source were detected. Daily gain was virtually the same for the two roughage levels (Table 3), but heifers fed 15% roughage diets consumed about 7% more ($P < .10$) DM per day than those fed 7.5% roughage diets; this increased consumption resulted in a slightly increased feed-to-gain ratio for heifers fed 15% roughage than for those fed 7.5% roughage.

Heifers fed alfalfa gained less ($P < .05$) per day (Table 3) than those fed either cottonseed hulls or sudangrass hay. Differences in gain reflected differences in feed intake: heifers fed alfalfa ate about 2 lb less ($P < .05$) DM per day than those fed sudangrass, with intermediate intake by heifers fed cottonseed hulls. Feed-to-gain ratio did not differ among roughage sources, although heifers fed alfalfa were least efficient.

The three roughages we used may have different effects on the flow of digesta [corn and(or) hay] from the rumen, which could alter feed intake. Chemical composition (Table 2) may help explain feed intake differences. We regressed pen means for DM intake on neutral detergent fiber (NDF) content of the six diets and found that NDF content accounted for 44% of the variation in DM intake. Further, dietary hemicellulose content accounted for 69% of variation in pen mean DM intake. Hemicellulose may be related to certain characteristics of the diet that affect DM intake.

These preliminary results suggest that roughage source can alter DM intake and daily gain by beef heifers fed whole corn diets. Further research is needed to verify these results and to determine possible mechanisms for altered feed intake.

Table 1. Ingredient composition of whole shelled corn diets fed to beef heifers (dry matter basis)

Ingredient, %	----- 7.5% roughage -----			----- 15% roughage -----		
	Alfalfa	Hulls	Sudangrass	Alfalfa	Hulls	Sudangrass
Corn	82.96	79.62	80.95	77.86	69.26	71.95
Roughage	7.31	7.43	7.67	14.67	14.85	15.30
Soybean meal	2.07	5.15	3.60	0.0	8.24	5.14
Molasses	4.84	4.83	4.82	4.86	4.83	4.81
Minerals, urea and premix ^a	2.82	2.97	2.96	2.61	2.82	2.80

^aMinerals included limestone, dicalcium phosphate and salt. Urea was included at .51% of dry matter in all diets. Premix was supplied through a Micro-Ingredient Machine and included trace mineral at 2 lb/ton, Rumensin (200 mg/heifer daily), Tylan (75 mg/heifer daily), vitamin A (1,000 IU/lb of diet) and vitamin E (200 IU/heifer daily).

¹We thank Syntex Animal Health, Inc., for supplying the Synovex H used in this experiment.

Table 2. Chemical composition of whole shelled corn diets fed to beef heifers^a

Item ^b	7.5% roughage			15% roughage		
	Alfalfa	Hulls	Sudangrass	Alfalfa	Hulls	Sudangrass
Dry matter	75.0	77.0	76.1	75.2	77.3	77.1
Ash	5.6	4.4	5.5	5.9	5.1	6.6
Crude protein	11.9	11.8	11.8	11.2	13.0	12.7
NDF	14.1	15.5	14.6	16.5	20.0	19.5
ADF	9.5	10.7	9.2	11.7	13.9	11.8
Hemicellulose ^c	4.6	4.9	5.4	4.8	6.1	7.8

^aAverage of samples collected throughout the 70-d experiment. Values other than dry matter are expressed on a dry matter basis.

^bNDF = neutral detergent fiber; ADF = acid detergent fiber.

^cHemicellulose = NDF - ADF.

Table 3. Influence of roughage source and level on performance of beef heifers fed whole shelled corn-based diets for 70 days

Item	Roughage level, %			Roughage source			
	7.5	15	SE ^a	Alfalfa	Hulls	Sudangrass	SE ^a
Pens per treatment	6	6		4	4	4	
Initial wt, lb	762	762	21	763	762	761	25
Final wt, lb	943	942	22	925	948	955	27
Daily gain, lb	2.59	2.57	.05	2.32 ^b	2.65 ^c	2.77 ^c	.07
Daily DM intake, lb	17.50 ^d	18.69 ^c	.41	17.07 ^b	18.12 ^{bc}	19.09 ^c	.50
Feed:gain	6.78	7.30	.20	7.38	6.84	6.90	.24

^aStandard error of main-effect means.

^bMeans within roughage source that have different letters in their superscripts differ ($P < .05$).

^cMeans within roughage level that have different letters in their superscripts differ ($P < .10$).

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