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CLAYTON LIVESTOCK RESEARCH CENTER

PROGRESS REPORT

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Roughage Sources for Finishing Steers Fed Whole-Shelled and Steam-Flaked Corn Diets[1]

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Previous research at the Clayton Livestock Research Center (Progress Report No. 69) indicated that roughage source could markedly affect feed intake by heifers fed 85 or 92.5% concentrate, whole-shelled corn-based diets. Heifers fed sorghum sudangrass hay as the roughage source consumed about 2 pounds more dry matter (DM) daily, and gained 19% more than heifers fed alfalfa as the roughage source. Because this previous experiment lasted only 70 days, and heifers were not taken to slaughter weights on the treatment diets, additional research was needed. Hence, the present experiment evaluated either alfalfa or sudangrass hay as roughages in 90% concentrate diets with finishing beef steers. Possible interactions of roughage source with corn processing method (whole-shelled or steam-flaked) also were examined.

Two hundred twenty-four mixed breed (British x Continental) steers were used. All steers had been adapted to an 85% concentrate diet before starting the experiment. Steers were weighed on two consecutive days at the start of the trial and assigned randomly to one of four treatments within light and heavy weight blocks. Each steer was implanted with Synovex S and vaccinated with a 7-way clostridial on the first of the two initial weigh days. Treatment diets (Table 1) were arranged in a 2 x 2 factorial and consisted of: 1) a whole-shelled corn-based diet with alfalfa (tub-ground field cubes) as the roughage; 2) whole-shelled corn with sudangrass (tub-ground large, round bales) as the roughage; 3) steam-flaked corn with alfalfa; and 4) steam-flaked corn with sudangrass. Steers were fed once daily in quantities sufficient to ensure ad libitum access to feed and were weighed at 28-day intervals throughout the trial. Each steer was revaccinated with a 7-way clostridial on day 56 and reimplanted with Synovex S on day 84 of the trial. The heavy block of steers was slaughtered after 126 days on feed, and the light block was slaughtered after 154 days on feed. Carcass data were collected only for steers in the light block.

Performance data during various segments of the experiment are shown in Table 2. Source of dietary roughage did not interact with corn processing method for any variable measured; hence, main effect means (roughage source averaged over corn processing and vice versa) are presented. Steers fed whole-shelled corn gained slightly more during the first 56 days than did those fed steam-flaked corn. From days 0 to 112, however, gain was less with whole than with steam-flaked corn. For the entire experiment, daily gain was the same for the two types of corn. Daily DM intake was greater ($P < .01$) by steers fed whole corn diets, which coupled with equal daily gain, resulted in a 12% greater feed-to-gain ratio for steers fed whole-shelled corn diets. Cattle fed sudangrass hay as the dietary roughage gained slightly more throughout the experiment than those fed alfalfa, and DM intake was consistently greater ($P < .02$) with sudangrass than with alfalfa. Nonetheless, the slight increase in daily gain was not sufficient to offset the increased feed intake, resulting in less efficient gain ($P < .05$) by cattle fed sudangrass as the dietary roughage. Feed cost per unit of gain was $.30, .32, .33 and .34 for the steam-flaked/alfalfa, steam-flaked/sudangrass, whole-shelled/alfalfa and whole-shelled/sudangrass diets. Thus, the lower cost of sudangrass did not overcome the less efficient gain noted with this roughage source.

Table 1. Ingredient composition of the 90% concentrate diets (% of dry matter)

	– Steam-flaked corn –		– Whole-shelled corn –	
Ingredient	Alfalfa	Sudangrass	Alfalfa	Sudangrass
Sudangrass hay	-	10.2	-	10.1
Alfalfa hay	10.2	-	10.1	-
Whole-shelled corn	-	-	77.7	75.7
Steam-flaked corn	77.5	75.5	-	-
Soybean meal	-	2.0	-	2.0
Molasses	5.1	5.1	5.0	5.0
Fat	2.0	2.0	2.0	2.0
Limestone	1.0	1.0	1.0	1.0
Dicalcium phosphate	.67	.67	.66	.66
Salt	.51	.51	.52	.52
Urea	.51	.51	.51	.51
Ammonium sulfate	.51	.51	.51	.51
Premix[a]	2.0	2.0	2.0	2.0

[a]Hominy feed-based premix. Consisted of: .42% vitamin A (30,000 USP units/g); .15% vitamin E (500,000 IU/kg); 5% trace mineral (4.4% Mn, .30% I, .20% Co, 6.6% Fe, 1.3% Cu, 12.0% Zn and 20.0% Mg); 1.16% monensin (132 g/kg); and .28% tylosin (220 g/kg).

Hot carcass weight was greater ($P < .03$) for light-block steers fed sudangrass than for those fed alfalfa (707 vs 684 pounds), and steers fed whole corn diets had a greater ($P < .06$) dressing percentage than those fed steam-flaked corn diets (62.7 vs 61.7%). No other carcass measurements were significantly affected by treatment. Only 3.6% of the light block cattle had liver abscesses.

[1]We thank Elanco Products Co. for suppling the monensin and tylosin used in this experiment and Syntex Animal Health, Inc. for supplying the Synovex S implants.

Based on net energy calculations from the performance of the cattle in this experiment, the NEm and NEg values of steam-flaked corn would have to have been 2.51 and 1.77 Mcal/kg, respectively. Values given by NRC (1984) are 2.38 and 1.67, respectively. The higher values noted in our study are similar to values calculated by Zinn (1987).

Based on the same type of net energy calculations described above, sudangrass hay would have to have had .39 and 0 (or negative) Mcal/kg NEm and NEg, respectively. The NRC (1984) values for sudangrass are 1.18 and .61 Mcal/kg, respectively. In a previous experiment (Progress Report No. 64), in which sudangrass (round bales) was supplemented with whole-shelled corn (corn was about 25% of the diet), predicted net energy values for sudangrass were very close to NRC (1984) values. Perhaps digestion of grass hay fiber is affected negatively in high-concentrate diets.

These results confirm our previous report of increased DM intake with sudangrass vs alfalfa as the dietary roughage. In contrast to our previous research, however, efficiency of gain was less, and cost of gain more, with sudangrass as the dietary roughage source.

Literature Cited

NRC. 1984. Nutrient Requirements of Beef Cattle. (6th Ed.). National Academy Press, Washington, DC.

Zinn, R. A. 1987. J. Anim. Sci. 65:256-266.

Table 2. Performance of finishing steers fed steam-flaked or whole-shelled corn diets with either alfalfa or sudangrass as the dietary roughage source

	Corn			Roughage			
Item	Steam-flaked	Whole-shelled	OSL[a]	Alfalfa	Sudangrass	OSL	SE[b]
No. of steers (pens)	112(8)	112 (8)	-	112 (8)	112 (8)	-	-
Initial BW, lb	680	680	NS	680	680	NS	.7
Final BW, lb	1,142	1,142	NS	1,136	1,147	NS	5.4
Days 0 to 56							
Daily gain, lb	3.73	3.88	NS	3.72	3.89	NS	.07
Daily DM intake, lb/steer	17.4	19.4	.01	17.6	19.2	.01	.23
Feed-to-gain	4.66	5.03	.01	4.72	4.96	.05	.07
Days 0 to 112							
Daily gain, lb	3.67	3.55	.08	3.58	3.63	NS	.04
Daily DM intake, lb/steer	18.4	20.1	.01	18.5	19.9	.02	.32
Feed-to-gain	5.01	5.68	.01	5.18	5.51	.02	.07
Day 0 to finish							
Daily gain, lb	3.31	3.31	NS	3.28	3.34	NS	.04
Daily DM intake, lb/steer	18.2	20.3	.01	18.5	19.9	.02	.30
Feed-to-gain	5.49	6.13	.01	5.67	5.96	.03	.07

[a]Observed significance level for main effects; probability of a difference is less than value indicated. NS = nonsignificant (P > .10).

[b]Standard error of main effect means, n = eight pens (14 steers each) per treatment.

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