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LIMIT FEEDING CONCENTRATE DIETS TO BEEF HEIFERS AS A REPLACEMENT FOR HAY OR PASTURE

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Story in Brief

Thirty-six Angus and Angus x Hereford heifers (692 ± 11 lb initial body weight) were used in a randomized complete block design to compare efficiency of limit-fed fibrous by-product diets with a limit-fed corn diet or free choice hay for developing yearling beef heifers. Dietary treatments consisted of: 1) free choice prairie hay plus a soybean meal-based supplement, 2) a whole shelled corn-based diet and .5% body weight prairie hay, 3) a wheat middlings/soybean hull-based diet and .5% body weight prairie hay, and 4) a barley malt sprout-based diet and .5% body weight prairie hay. All diets were fed once daily and contained 200 mg of Rumensin™ per head. Diets were formulated to achieve 1 lb/d gain using reported energy values. Weight gains were higher in the three concentrate diet groups. Gains among concentrate diets were not different. Cost/lb of gain was least for the barley malt sprout and corn diets. Based on observed performance, the improvement in dietary energy use was similar among limit-fed corn and limit-fed fibrous by-product diets.

Key Words: Cattle, Limit Feeding, By-products

Introduction

Limit feeding concentrate diets is an alternative feeding system that can be used when standing forage is limited or when harvested forages are too costly. Work by Loerch (1996) suggested that mature cows can be maintained through gestation and lactation using corn based limit-fed diets without loss in cow or calf performance. In another study (Tjardes, 1998), performance did not differ for cows receiving ad libitum hay or limit-fed corn diets. Loerch (1996) suggested that traditional methods of feeding free choice hay and supplement can be up to 100% more expensive than limit feeding commodity based diets. Economic advantages of limit-fed diets are dependent on price and quality of forage and gain as well as the efficiency of the limit-fed diet. Our objective was to compare performance, cost and improvement of dietary energy use when developing heifers are fed hay or various limit-fed commodity based diets.

Materials and Methods

This study was conducted at the Willard Sparks Beef Research Center near Stillwater, OK. Thirty-six beef heifers were used in a complete randomized block design with four treatments and three weight blocks per treatment.

Dietary treatments (Table 1) consisted of: 1) free choice prairie hay (5% CP, DM basis) plus 2 lb soybean meal-based supplement (CONT), 2) a whole shelled corn-based diet fed at 1.28% of BW with .5% BW hay (CORN), 3) a wheat middlings/soybean hull-based diet fed at 1.5% BW with .5% BW hay (WMSH), and 4) a barley malt sprout-based diet fed at 1.7% BW with .5% BW hay (BMS). All diets were formulated for 1 lb weight gain per day using 1989 and 1996 National Research Council feed energy values. Composition of supplements and WMSH feed are shown in Table 2. Heifers underwent a 5-d adaptation at the beginning of the study, during which concentrate was gradually increased. Five days before the end of the study all heifers were fed limited amounts of hay and supplement to reduce the effects of gut fill. All cattle were fed 1.5% BW hay and CONT supplement from d 85 to d 90 in order to adjust for differences in GI tract fill. Initial and final weights were taken after a 16-h shrink with food and water removed. Data were analyzed by analysis of variance with treatment, block and treatment x block interaction as main effects. Pre-planned orthogonal contrasts were used to compare differences among treatments.

Results and Discussion

Animal performance, feed efficiency and feed costs are shown in Table 3. There was no incidence of bloat or acidosis observed throughout the study. Heifers were treated for internal and external parasites prior to the study. Daily gain was greater (1.38 lb, $P<.05$) for heifers fed concentrate diets compared with CONT heifers (1.12 lb). Daily gain among concentrate-fed groups did not differ significantly. Body condition score did not differ. By design, feed DM intake differed ($P<.05$) among all groups. Feed:gain for CONT fed heifers was 101% greater compared with limit-fed diets (18.1 vs 9.0, $P<.01$) and feed:gain for CORN was 22% lower than BMS ($P<.05$). Efficiency of WMSH and BMS was similar ($P=.06$). Limit-fed diet tabular net energy values were compared with values calculated from animal performance and DMI. Net energy for gain of CORN, WMSH and BMS was 24.7, 26.8, and 27.8% greater than tabular values and did not differ among limit-fed groups.

Commodity-based diets, fed at a restricted intake, can be used to meet nutritional needs for developing heifers without adverse effects on performance. Limit feeding concentrate diets is a viable alternative to feeding ad libitum hay during winter months. We conclude that the improvement in efficiency of limit-fed fibrous by-product concentrate diets is similar to the improvement seen in energy value of corn based limit-fed diets.

Literature Cited

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Table 1. Intake and nutrient composition of diets (as fed).

	HAY	CORN	WMSH	BMS
Hay, lb	19[a]	3.5	3.5	3.5
Supplement, lb	2	2	--	1
Concentrate, lb	--	7	10.5	10.6
Intake lb/hd/d	21	12.5	14	15.1
Nutrients supplied				
TDN, lb/d[b]	9.7	9.2	8.9	9.0
Nem, Mcal/d[b]	9.8	8.6	8.7	8.8
Neg, Mcal/d[b]	4.8	5.5	5.3	5.1
Protein, lb/d[b]	1.5	1.5	1.5	1.9
Ca, g/d[b]	27	31	34	43
P, g/d[b]	17	21	25	39
K, g/d[b]	94	45	66	54
Rumensin, mg/d	200	200	200	200

[a]Hay fed *ad libitum.*

[b]Calculated from NRC, 1996.

Table 2. Supplement or feed composition, % as fed.

Ingredient	HAY	CORN	WMSH	BMS
SBM	35.0	59.0	--	--
CSM	35.0	--	2.86	--
Wheat midds	23.2	23.0	38.1	75.8

Soy hulls	--	--	28.6	--
Corn	--	--	24.2	--
Molasses	3.8	3.75	4.76	4.0
Limestone	--	5.0	.952	14.0
Salt	2.5	2.5	.476	5.0
Urea	--	2.25	--	--
Rumensin 80	.125	.125	.024	--
Vitamin A 30,000	.15	.15	.029	.3
Copper sulphate	.02	.035	.005	.08
Selenium 600	.25	.15	.029	.5
Zinc oxide	.01	.02	.0001	.04
Dicalcium phosphate	--	3.0	--	--
Potassium chloride	--	1.0	--	--

Table 3. Performance and efficiency of developing heifers.

	HAY	CORN	WMSH[a]	BMS	SE
Initial BCS	5.0	4.9	4.9	4.8	.1
Final BCS	5.3	5.3	5.3	5.4	.1
BCS change	.3	.4	.4	.6	.1
Initial wt	716	664	684	697	11.1
Final wt	812	782	802	814	15.9
ADG, lb	1.1	1.4	1.4	1.4	.1
Feed/gain, lb	18.1	7.9	9.0	10.1	.6
Cost/day, $	.76[b]	.75[c]	.83[d]	.70[e]	
Cost/lb gain, $	.67	.54	.60	.51	

[a]Fed as concentrate and supplement.

[b]Hay = $60/ton; Supplement = $190/ton.

[c]Hay = $60/ton; Supplement = $190/ton; Corn = $2.40/Bu.

[d]Hay = $60/ton; Concentrate/Supplement = $137/ton.

[e]Hay = $60/ton; Supplement = $220/ton; Concentrate = $90/ton.

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