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High Energy Digestible Fiber-based Diets Improve Efficiency in Growing Heifers

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High Energy Digestible Fiber-based Diets Improve Efficiency in Growing Heifers

Abstract

An inherent challenge of long hauled, highly stressed calves is decreased feed intake upon destination arrival. Highly stressed, newly received stocker calves not consuming adequate amounts of energy are prone to a variety of disorders such as Bovine Respiratory Disease Complex and decreased performance throughout the feeding period. One mechanism that can be used to increase energy intake upon arrival is to make the diet more energy dense. Often times, this is accomplished by the addition of cereal grains high in fermentable carbohydrate including starch. Unfortunately, this has also been linked to increasing morbidity due to metabolic disorders. The goal of this study was to analyze the effects of limit-fed diets containing increasing amounts of energy from highly digestible fiber in by-product feeds on health and performance of newly received stocker calves.

Keywords

wet corn gluten feed, health, limit-feeding

Authors

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Introduction

An inherent challenge of long hauled, highly stressed calves is decreased feed intake upon destination arrival. Highly stressed, newly received stocker calves not consuming adequate amounts of energy are prone to a variety of disorders such as Bovine Respiratory Disease Complex and decreased performance throughout the feeding period. One mechanism that can be used to increase energy intake upon arrival is to make the diet more energy dense. Often times, this is accomplished by the addition of cereal grains high in fermentable carbohydrate including starch. Unfortunately, this has also been linked to increasing morbidity due to metabolic disorders. The goal of this study was to analyze the effects of limit-fed diets containing increasing amounts of energy from highly digestible fiber in by-product feeds on health and performance of newly received stocker calves.

Key words: wet corn gluten feed, health, limit-feeding

Experimental Procedures

Four loads, containing 370 crossbred heifers assembled from Tennessee and Alabama sale barns and combined at a Dickson, TN order buyer facility (initial body weight = 491 ± 37 lb) were received at the Kansas State University Beef Stocker Unit in the summer of 2016. On arrival cattle were weighed and given an individual animal identification number. The following morning cattle were vaccinated against common viral and clostridial diseases (Pyramid 5 + Presponse, Vetmedica, St. Joseph, MO; Baytril 100, Bayer Healthcare, Animal Health Division, Shawnee Mission, KS; Vison 7 with Somnus, Merck Animal Health, Madison, NJ) and dewormed (Safeguard, Merck Animal Health, Madison, NJ). Each load represented a block that was stratified by weight and randomly assigned to 8 pens. Pens were randomly assigned to one of 4 treatments with 8 pens per treatment (10-13 heifers per pen). The 4 treatments supplied 45, 50, 55, and 60 Mcals net energy for gain/100 lb of feed. The 45 treatment was provided *ad libitum* and the other 3 were fed at decreasing levels based on the intake of 45 treatment as follows: 50 treatment fed at 95%, 55 treatment at 90%, and 60 treatment at 85%. All treatments were formulated to contain 40% wet corn gluten feed on a dry matter basis (Table 1).

Treatments were fed each morning at approximately 7:00 a.m. Before feeding each day, all bunks containing refusals were cleaned and their contents weighed. Actual dry matter consumption was calculated for the control group to dictate feed delivery to the other treatments as described above. The duration of the trial was 55 days including a 14-day gut fill equalization period in which the 45 treatment diet was fed to all animals. Animals were weighed on days 0, 14, 27, 41, and 55. Performance and health data were analyzed in the MIXED procedure of SAS (version 9.3; SAS Institute, Cary, NC) with the fixed effect of dietary treatment and the random effect of block. The pen was the experimental unit.

Results and Discussion

The effects of energy density of the diets and intake are shown in Table 2. Overall, cattle performed similarly on all treatments and there were no differences in morbidity or mortality. However, interactions were detected between dietary treatment and efficiency of feed conversion since the animals performed similarly on varying levels of dry matter intake.

Implications

Limit feeding high-energy diets based primarily on highly digestible fiber from by-product feeds such as wet corn gluten can offer a more efficient approach to feeding newly received calves without increasing morbidity or mortality. The possibility of decreased step-up or transition diets traditionally used to adapt feeder calves to a higher-energy finishing ration on entry to the feedlot could offer additional benefit since these calves would presumably be adapted to a higher-energy ration beforehand.

Table 1. Experimental diets

	Treatment[1]			
	100% dry matter basis			
Ingredient	45/100	50/95	55/90	60/85
Dry-rolled corn	8.57	19.08	28.50	38.82
Low-energy supplement	6.43	6.92	7.50	8.18
Alfalfa hay	22.50	17.00	12.00	6.50
Prairie hay	22.50	17.00	12.00	6.50
Wet corn gluten feed	40.00	40.00	40.00	40.00
Total	100.00	100.00	100.00	100.00
Calculated nutrient content				
Dry matter, %	73.5	73.2	72.9	72.6
Protein, %	16.39	15.94	15.52	15.07
Calcium, %	0.91	0.86	0.82	0.79
Phosphorus, %	0.53	0.54	0.55	0.56
Salt, %	0.32	0.35	0.38	0.41
Potassium, %	1.39	1.24	1.11	0.96
Magnesium, %	0.26	0.25	0.24	0.24
Fat, %	2.89	2.99	3.08	3.18
Acid detergent fiber, %	21.41	17.62	14.17	10.38
Net energy main, Mcal/cwt	73.21	79.08	84.34	90.09
Net energy gain, Mcal/cwt	45.28	50.40	55.01	60.06

[1]First number is net energy for gain in Mcal/100 lb dry matter. Second number is dry matter intake as percent of 100.

Table 2. Effects of dietary net energy for gain and intake on newly arrived heifer performance and health

	Treatment[1]				
Item	45/100	50/95	55/90	60/85	SEM[2]
Day 0 body weight, lb	490	493	490	491	5.37
Day 14 body weight, lb	539[b]	528[b,c]	520[b,c]	515[c]	8.70
Day 27 body weight, lb	555[b]	555[b]	549[b,c]	545[c]	9.35
Day 41 body weight, lb	590	591	585	586	7.27
Day 55 body weight, lb	614	617	616	623	8.21
Day 14 average daily gain, lb/day	3.48[b]	2.48	2.15	1.70	0.33
Day 27 average daily gain, lb/day	2.40[b]	2.29[b,c]	2.20[b,c]	2.00[c]	0.22
Day 41 average daily gain, lb/day	2.44	2.39	2.31	2.31	0.13
Day 55 average daily gain, lb/day	2.26	2.25	2.29	2.40	0.11
Day 14 dry matter intake, lb/day	10.60[b]	10.07[b,c]	9.70[c]	9.00[d]	0.62
Day 27 dry matter intake, lb/day	12.24[b]	11.34[c]	10.85[c,d]	10.14[d]	0.54
Day 41 dry matter intake, lb/day	13.67[b]	12.60[c]	11.92[c,d]	11.25[d]	0.50
Day 55 dry matter intake, lb/day	14.51[b]	13.51[c]	12.88[c,d]	12.51[d]	0.46
Day 14 feed:gain	3.16	4.60	4.72	9.18	1.93
Day 27 feed:gain	5.19	5.06	5.19	5.29	0.41
Day 41 feed:gain	5.67	5.32	5.31	4.91	0.32
Day 55 feed:gain	6.48[b]	6.11[b,c]	5.65[c,d]	5.22[d]	0.22
Day 14 gain:feed	0.329[b]	0.241[b,c]	0.225[c]	0.182[c]	0.0333
Day 27 gain:feed	0.197	0.201	0.202	0.196	0.0158
Day 41 gain:feed	0.179[b]	0.189[b,c]	0.195[b,c]	0.206[c]	0.0105
Day 55 gain:feed	0.156[b]	0.166[b,c]	0.178[c,d]	0.192[d]	0.0064
Day 14 intake as % of body weight	2.06[b]	1.97[b,c]	1.92[c]	1.79[d]	0.09
Day 27 intake as % of body weight	2.34[b]	2.16[c]	2.09[c,d]	1.96[d]	0.08
Day 41 intake as % of body weight	2.53[b]	2.32[c]	2.22[c,d]	2.09[d]	0.07
Day 55 intake as % of body weight	2.63[b]	2.43[c]	2.33[c,d]	2.25[d]	0.06

[1]First number is net energy for gain in Mcal/100 lb dry matter. Second number is dry matter intake as percent of 100.

[2]SEM=standard error of the mean.

[bcd]Means within a row with uncommon superscripts differ ($P<0.05$).