EFFECT OF PULSE GRAINS ON PERFORMANCE OF NEWLY WEANED FEEDLOT STEERS

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Abstract

One hundred seventy six mixed breed steers from 40 different ranches in North Dakota and Montana (initial BW 560.2 ± 40.9 lbs) were allotted by weight and source to one of four receiving diets containing either chick peas, field peas, lentils, or corn and canola meal as a concentrate and protein source. Diets were approximately 47 % roughage. Cattle were fed at the Carrington Research and Extension Center (CREC) in 16 open drylot pens (11 steers per pen; 4 pens per treatment) as part of the Turtle Lake feedlot project, which is designed to provide producers with an understanding of their calves genetic potential to perform in a North Dakota feedlot. Experimental diets were fed for 40 days, after which cattle were fed a common diet containing approximately 68.4 % concentrate on a DM basis. Cattle fed chick pea, field pea, or lentil-based diets during the first 20 d period gained 25.9 % faster (3.12 vs 2.48 lb/d) and consumed more dry matter per day (11.9 vs 10.2 lb/d) compared to cattle fed the corn-canola based diet ($P < 0.01$). Feed efficiency did not differ ($P > 0.32$) among treatments for the first 20 d period. During the second 20 d period, no difference in gain, dry matter intake, or feed efficiency occurred ($P > 0.38$), indicating that an advantage for feeding pulse grains exists during the first 3 weeks of receiving newly weaned cattle. When measured for the entire 40 d receiving period, cattle fed pulse grain-based diets gained 9.2 % faster (4.02 vs 3.68 lb/d; $P < 0.05$), and tended ($P = 0.11$) to consume more dry matter per day (16.3 vs 15.0 lb/d) compared to cattle fed the corn-canola based diet. Cattle previously fed pulse grains continued follow a trend for increased gains for the 7 week period after the termination of the receiving trial. Feed intake of newly arrived calves is often low during the first 2 weeks of the feedlot receiving period because of the stress of weaning and shipping. Pulse grains are highly palatable and nutrient dense, making them ideal for inclusion in rations of stressed calves. Results from this study indicate that pulse grains in the diets of newly received calves increases intake and gain, thus mitigating the stress associated with weaning and shipping.

Introduction

Field peas, chick peas, and lentils (pulse grains) are marketed as dry, shelled products primarily for human consumption. Surplus grain, off quality grains, and screenings which contain high levels of protein (22 to 30 % CP on a DM basis) and energy (45 to 60 Mcal/cwt NEg), are an attractive, nutrient dense livestock feed. Significant amounts of pulse grains are produced annually in the northern Great Plains of the United States and the prairie Provinces of Canada. North Dakota leads the United States in pulse grain production, giving producers in the state a high quality option for protein in beef cattle rations. Field peas can be successfully included in corn or barley based rations as a protein supplement; however, very little information is available on the use and nutritional value of chick peas and lentils in beef cattle diets.

Feed intake of newly arrived calves is often low during the first 2 weeks of the feedlot receiving period because of the stress of weaning and shipping. Fluharty and Loerch (1995) demonstrated that because of low dry matter intake, increasing the CP concentration of the diet to 16 % during the first 2 weeks more closely matches the animal's gram requirement for protein, and results in increased average daily gain. Various sources of protein (soybean meal, corn gluten meal, blood meal, and fish meal) were tested with no effect on intake or gain; however high protein grains, which are highly palatable and nutrient dense were not tested. Anderson (1999a) observed that gain and creep feed intake of calves increased linearly as dry-rolled peas were added to the diet to replace wheat midds at 0, 33, 67, and 100 %. Field peas have also been successfully integrated into feedlot growing and finishing diets (Anderson, 1999b), but little information is available on their effect during the receiving period, and little information is available on the effect of chick pea and lentil inclusion in the diet. Thus the objective of this study was to determine if replacing a portion of a typical corn and canola meal diet with pulse grains would improve feed intake, gain, and feed efficiency of newly arrived feedlot cattle.

Procedures

One hundred seventy six mixed breed steers from 40 different ranches in North Dakota and Montana (initial BW 560.2 ± 40.9 lbs) were allotted by weight and source to one of four receiving diets (Table 1) containing either chick peas, field peas, lentils, or corn and canola meal as a concentrate and protein source. Diets were formulated to contain 16 % crude protein and 51 Mcal/cwt NEg. Cattle were fed at the Carrington Research and Extension Center (CREC) in 16 pens (11 steers per pen; 4 pens per treatment) as part of the Turtle Lake feedlot project, which is designed to provide producers with an understanding of their calves genetic potential to perform in a North Dakota feedlot. Feed was delivered as a totally mixed ration once daily to appetite. Cattle were fed in open drylot pens equipped with automatic waterers and fenceline bunks, which allowed for 2 feet of bunk space per head. Experimental diets were fed for 40 days, after which cattle were fed a common diet containing approximately 68.4 % concentrate on a DM basis. Effect of receiving diets on subsequent performance was evaluated for the 7 week period following the end of the trial.

Three weeks prior to feedlot entry, cattle were vaccinated for protection against IBR, BVD, BRSV, PI3 (Bovishield-4; Pfizer, Exton, PA), and clostridia (7-way + somnus; Pfizer, Exton, PA). Upon arrival at the CREC feedlot (October 11, 2003) cattle were implanted with Synovex-S (200 mg progesterone, 20 mg estradiol; Fort Dodge Animal Health, Overland Park, KS), re-vaccinated, ear-tagged, weighed, and allotted to treatment. Health status of the cattle was monitored daily. Rectal temperatures were measured in animals that were visibly anorexic, or had severe nasal mucous drainage and rapid or labored breathing. Any animal with a rectal temperature > 103.0^{o}F was treated with one of two antibiotics according to label instructions (Micotil, Elanco, Indianapolis, IN; Baytril, Bayer, Shawnee Mission, KS). Micotil was used on first and second pulls, followed by Baytril (single day therapy), if cattle were unresponsive. Antibiotic treatment continued until rectal temperature was below 103.0^{o}F. Research protocols regarding animal care followed guidelines recommended in the Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching (FASS, 1998).

Data were subjected to a one-way analysis of variance as a completely randomized design using the GLM procedures of SAS (Version 8.0; SAS Inst. Inc., Cary, NC). Planned pair-wise

comparisons (least significant difference) were used to separate treatment least squares means when the F-test was significant ($P < 0.05$). In addition, a contrast was used to compare the control diet to the three diets containing pulse grains. The model included effects due to diet and pen was the experimental unit for all analyses.

Results and Discussion

Cattle fed chick pea, field pea, or lentil-based diets during the first 20 d period gained 25.9 % faster (3.12 vs 2.48 lb/d) and consumed more dry matter per day (11.9 vs 10.2 lb/d) compared to cattle fed the corn-canola based diet ($P < 0.01$, Table 2.). Feed efficiency did not differ ($P > 0.32$) among treatments for the first 20 d period. During the second 20 d period, no difference in gain, dry matter intake, or feed efficiency occurred ($P > 0.38$), indicating that an advantage for feeding pulse grains exists during the first 3 weeks of receiving newly weaned cattle. Fluharty and Loerch (1995) demonstrated a similar diminishing response, but the effect was due to protein level, not source. Cattle on high protein diets (16 % and 18 % CP) had increased gains and dry matter intake the first week of the receiving period compared to cattle on lower protein diets (12 and 14 % CP), but the differences diminished by the second week on feed. Protein level was the same among the four treatments in this trial, indicating that protein from pulse grains may be more palatable or digestible compared to protein from canola or corn or even those (soybean meal, blood meal, corn gluten meal, fish meal) used by Fluharty and Loerch (1995). When measured for the entire 40 d receiving period of the present trial, cattle fed pulse grain-based diets gained 9.2 % faster (4.02 vs 3.68 lb/d; $P < 0.05$), and tended ($P = 0.11$) to consume more dry matter per day (16.3 vs 15.0 lb/d) compared to cattle fed the corn-canola based diet. Cattle previously fed pulse grains continued follow a trend for increased gains for the 7 week period after the termination of the receiving trial.

Pulse grains are highly palatable and nutrient dense, making them ideal for inclusion in rations of stressed calves. Results from this study indicate that pulse grains in the diets of newly received calves increases intake and gain, thus mitigating the stress associated with weaning and shipping.

Literature Cited

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Table 1. Diet composition

Item	Control	Field pea	Chick pea	Lentil
Ingredients		----------% DM basis----------		
Corn	39.30	32.43	30.46	32.91
Canola meal	9.42	2.22	2.28	
Field peas		16.26		
Chick peas			16.80	
Lentils				17.31
Alfalfa	26.87	27.13	27.79	27.37
Corn silage	21.47	19.18	19.94	19.75
Barley malt sprouts	1.00	0.94	0.93	0.90
Dicalcium phosphate	0.04	0.04	0.04	0.04
Limestone	0.27	0.26	0.25	0.25
Potassium chloride	0.17	0.16	0.15	0.15
Rumensin 80	0.01	0.01	0.01	0.01
Sodium chloride	0.10	0.09	0.09	0.09
Vitamin A	0.01	0.01	0.01	0.01
Vitamin D	0.01	0.01	0.01	0.01
Vitamin E	0.01	0.01	0.01	0.01
Zinc sulfate	0.01	0.01	0.01	0.01
YeaSacc 1026	0.87	0.82	0.81	0.78
Deccox	0.44	0.42	0.41	0.40
Nutrient composition				
Crude protein, %	15.86	15.75	16.35	16.19
Calcium, %	0.69	0.66	0.67	0.64
Phosphorus, %	0.45	0.41	0.41	0.40
NEm, Mcal/cwt	80.0	80.2	78.2	78.9
NEg, Mcal/cwt	51.8	52.0	49.7	50.5

Table 2. Effect of inclusion of pulse grains in the diet on performance.

Item	Control	Field Peas	Chick Peas	Lentils	P < SE	P < Pulse vs Control
Weight, lb						
Initial	558.5	559.4	561.7	561.3	40.9	0.96
Intermediate	610.6	626.2	627.3	625.8	41.1	0.74
Final	712.9	727.4	735.3	733.4	46.1	0.72
Post-trial (7 weeks)	882.4	926.7	933.3	931.1	--------	--------
Average daily gain, lb/d						
Period 1	2.48	3.18	3.12	3.07	0.16	0.01
Period 2	4.87	4.82	5.14	5.12	0.29	0.64
Receiving overall	3.68	4.00	4.13	4.10	0.16	0.05
Post-trial (7 weeks)	3.46	4.07	4.04	4.03	--------	--------
Total dry matter intake, lb						
Period 1	192.9	224.4	224.5	230.9	9.7	0.01
Period 2	407.7	417.3	422.3	438.8	17.5	0.38
Receiving overall	600.6	641.8	646.8	669.8	26.2	0.11
Post-trial (7 weeks)	837.9	886.0	839.1	795.8	--------	--------
Daily dry matter intake, lb/d						
Period 1	10.2	11.8	11.8	12.2	0.5	0.01
Period 2	19.4	19.9	20.1	20.9	0.8	0.38
Receiving overall	15.0	16.0	16.2	16.7	0.7	0.11
Post-trial (7 weeks)	22.0	23.3	22.1	20.9	--------	--------
Feed efficiencey, lb/lb						
Period 1	4.1	3.7	3.7	4.0	0.4	0.32
Period 2	4.0	4.1	3.9	4.1	0.1	0.68
Receiving overall	4.1	4.0	3.9	4.1	0.1	0.27
Post-trial (7 weeks)	6.4	5.7	5.5	5.2	--------	--------