

An Evaluation of a Mixed Co-product Protein Feed in Finishing Rations

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Introduction

North Dakota produces approximately three million tons of co-product feeds in a year including significant amounts of soybean meal and soybean hulls. Historically, we have exported these feed ingredients individually to feed markets around the world. Most of the multitude of co-products have some unique properties that could be improved upon by mixing with other co-products to improve nutritional and physical properties. Mixing three or more co-product feeds together and pelleting the mixture creates a new feed commodity. The nutrient content of the new feed is obviously based on the formulation which can potentially be adapted to specific market opportunities. The new pelleted commodities have greater bulk density for shipping advantages. They also may be more flexible in end use, nutrient profile, longer shelf life, improved flow properties, simplified feeding for end users, and improved safety.

Experimental Procedures

Steer calves (n=176) from 43 different ranches belonging to the Dakota Feeder Calf Club at Turtle Lake, ND, were consigned to the Carrington Research Extension center in the fall of 2008. Each ranch consigned three to eight steers for the feedout project to observe the feedlot performance and carcass value from their respective breeding program. After a preconditioning program, steers were individually weighed, blocked by weight and allotted within weight block to one of four treatments. Steers from each ranch were allotted to different treatments to reduce "ranch" effects. The treatments were designed to provide increasing levels of a mixed co-product "superfeed" formulated with 50% soybean meal, 35 percent distillers grains, and 15 percent field peas. The co-product protein supplement was manufactured by the Northern Crops Institute feed production center in Fargo, ND. This 35 percent crude protein feed was included in the treatment diets at 0, 5, 10, and 15 percent of the dry matter as a protein supplement. Canola meal was used as the control protein source. Ration formulations are provided in Table 1. A totally-mixed corn-based ration was fed to appetite daily in fenceline bunks. Steers were provided wind protection and bedded during the relatively severe winter. Steers were weighed every 28 days with feed intake summarized for each weigh period. Feed efficiency was calculated based on average dry matter intake and average daily gain for each period and overall. Steers were marketed to Tyson Meats, Dakota City, NE on May 6, after evaluation by visual appraisal that 60% or more would grade USDA Choice. Carcass traits were evaluated after a 24-hour chill by trained personnel.

Table 1. Rations for steers fed increasing coproduct formulation as protein supplement.

Ingredient	Treatment			
	0%	5%	10%	15%
	Percent, Dry matter basis			
Corn, dry rolled	69.2	69.3	69.4	69.5
Co-product protein suppl	0.0	5.0	10.1	15.2
Canola meal	15.6	10.4	5.2	0.0
Straw, chopped	6.9	6.9	6.9	6.9
Corn silage	6.5	6.6	6.5	6.6
Calcium carbonate	0.5	0.5	0.5	0.5
Suppl (Rumensin, vit, min)	1.3	1.3	1.4	1.3
Nutrient Content				
Dry Matter, %	78.78	78.67	78.77	78.66
Neg, Mcal/lb	60.33	61.51	62.72	63.91
Crude Protein, %	13.94	13.64	13.39	13.11
Calcium, %	0.45	0.43	0.43	0.41
Phosphorous, %	0.40	0.39	0.37	0.35
Potassium, %	0.60	0.62	0.64	0.66

Results and Discussion

Despite the severe winter weather, steer performance in all treatment groups was very satisfactory. We observed no statistical difference between the treatments in this trial for any of the feedlot performance measures (Table 2). The energy density (NEg) increased slightly as the proportion of “superfeed” increased in the ration, however, protein content decreased from 13.94 to 13.11 percent from 0 to 15 percent superfeed. Feed intake for the steers in the respective treatments was 21.01, 22.10, 22.43, and 22.47 for 0, 5, 10, and 15 percent superfeed treatments. Gains throughout the feeding period averaged 3.65, 3.68, 3.67, and 3.85 respectively, for 0, 5, 10, and 15 percent superfeed in the diet. Feed efficiency (feed per gain) was calculated at 4.84, 5.17, 5.24, and 4.80 for increasing superfeed.



Despite severe winter weather, steer performance was very satisfactory.

Table 2. Feedlot performance of cattle fed mixed coproduct supplement (CPS) at increasing levels.

Item	Percent Co-Product supplement						Contrasts		
	0%	5%	10%	15%	Std. Error	P-Value	CPS vs. no CPS	linear	quadratic
Live Wt, lbs									
Initial Wt (29-Jan)	963.8	988.5	971.6	957.9	39.7	0.24	0.51	0.50	0.14
Period 1 Wt. (25-Feb)	1071.4	1093.1	1082.1	1074.5	43.8	0.60	0.42	0.99	0.28
Period 2 Wt. (06-Apr)	1209.6	1237.1	1215.7	1219.8	40.7	0.60	0.41	0.89	0.46
Period 3 Final Wt. (06-May)	1314.4	1346.4	1321.6	1328.1	42.7	0.57	0.38	0.83	0.47
DM Intake, lb/hd/day									
Period 1	19.05	19.92	20.45	20.65	1.38	0.87	0.44	0.41	0.82
Period 2	21.92	23.06	23.09	22.96	1.18	0.87	0.42	0.55	0.60
Period 3	22.08	23.31	23.73	23.80	0.91	0.54	0.19	0.22	0.56
Overall DMI	21.02	22.10	22.43	22.47	1.16	0.80	0.34	0.38	0.67
Average Daily Gain, lb/hd/day									
Period 1 (27d)	3.98	3.88	4.04	4.33	0.21	0.48	0.67	0.22	0.40
Period 2 (40d)	3.45	3.63	3.67	3.63	0.16	0.65	0.65	0.72	0.81
Period 3 (30d)	3.48	3.65	3.60	3.60	0.29	0.98	0.69	0.81	0.78
Overall ADG	3.65	3.68	3.67	3.85	0.11	0.57	0.55	0.27	0.51
Feed Efficiency									
Gain:Feed Period 1	0.21	0.20	0.21	0.21	0.02	0.93	0.86	0.85	0.76
Gain:Feed Period 2	0.16	0.16	0.15	0.16	0.01	0.92	0.83	0.93	0.63
Gain:Feed Period 3	0.16	0.16	0.15	0.15	0.02	0.99	0.78	0.72	0.99
Overall G:F	0.17	0.17	0.17	0.17	0.01	0.99	0.75	0.90	0.75
Feed:Gain Period 1	4.84	5.17	5.24	4.80	0.56	0.91	0.72	0.98	0.50
Feed:Gain Period 2	6.45	6.41	6.86	6.34	0.41	0.81	0.85	0.94	0.56
Feed:Gain Period 3	6.48	6.55	6.79	6.66	0.60	0.99	0.79	0.78	0.88
Overall F:G	5.79	5.97	6.17	5.83	0.37	0.90	0.65	0.84	0.51

Carcass traits were similar except for backfat and USDA Yield Grade (Table 3). The steers on 5 percent superfeed had more backfat than 10 percent superfeed with 0, and 15 percent treatment steers intermediate. Yield Grade was lowest for the 10% treatment, and highest for the 5 percent treatment with 0 and 15 percent intermediate. Marbling scores were not statistically different, but we observed a numerical increase in the percent USDA Choice carcasses with increasing superfeeds. The number of choice or better carcasses was 61.36, 67.44, 76.74, and 77.27 percent respectively, for 0, 5, 10, and 15 percent superfeed. This factor could have significant value for the feeder as the value of a lean choice carcass such as observed with 10 percent superfeed would be attractive to the industry and return greater value per pound.

Table 3. Carcass traits of cattle fed mixed coproduct protein supplement at increasing levels.

Item	Percent Co-Product supplement				Std. Error	P-Value	Contrasts		
	0%	5%	10%	15%			CPS vs. no CPS	linear	quadratic
Hot Carcass Wt., lbs.	789.2	820.8	794.2	806.5	25.09	0.31	0.23	0.65	0.46
Dressing Percent	63.25	64.18	63.26	63.95	0.38	0.39	0.11	0.32	0.26
Back Fat, in	0.40	0.46	0.37	0.42	0.03	0.02	0.78	0.47	0.59
Ribeye Area, sq in	13.50	13.62	13.62	13.71	0.27	0.85	0.47	0.43	0.93
Kidney Pelvic Heart, %	2.43	2.43	2.44	2.42	0.02	0.94	0.94	0.75	0.66
USDA Yield Grade*	2.66	2.90	2.51	2.71	0.10	0.07	0.67	0.50	0.84
Marbling Score**	421.8	434.9	445.7	438.9	16.04	0.79	0.36	0.41	0.56
Percent Choice***	61.36	67.44	76.74	77.27	-	-	-	-	-

* USDA Yield Grade is a calculated value that is determined by a formula comparing fat to lean muscle in the carcass.

** Marbling score is based on intermuscular fat in the ribeye: 400-499 = low Choice , 500-599 = Avg Choice.

*** Percent choice was not statistically analyzed.

Implications

The results of this study suggest that a mixed co-product “superfeed” may be successfully marketed based on animal performance and especially based on percentage of USDA Choice carcasses. The ease of use, safety, and handling properties of this pelleted commodity are superior to any single feed ingredient. Using soybean meal as a base ingredient helps increase the value of the meal and diversify the market potential to other species or production scenarios. This study gives confidence to livestock producers interested in using a combinatorial feed comprised of multiple co-products. It remains to be seen if feed manufacturing businesses are interested in developing commodities from combining co-products into commercial pelleted feeds to produce products that can be labeled as North Dakota “Superfeed.”

