Effect of an Isolated Soy Protein By-Product on Finishing Cattle Performance and Carcass Characteristics

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Story in Brief

The objective was to determine if molasses and soybean meal could be replaced by an isolated soy protein byproduct in diets fed to finishing cattle. No effects on performance or carcass adjusted performance were observed. However, the isolated soy protein byproduct did decrease the percentage of cattle grading Choice in this experiment. Because hot carcass weight, ribeye area, and marbling scores were not affected, we conclude that isolated soy protein by product can be used as a liquid feed in finishing diets.

Introduction

Soybean meal (SBM) is a common source of protein used in diets fed to feedlot cattle. In the U.S., the majority of soybeans are processed using a solvent-extraction process. The finished meal from dehulled soybeans contains less than 1.5% crude fat and approximately 48% CP on a DM basis. In addition to the protein, Drouillard et al. (1999) suggested that the carbohydrate fraction of soybean meal might be of value for stimulating ruminal digestion. Further isolation of protein from defatted soy flakes results in a liquid (56.7% DM) by-product (NXP25) composed of carbohydrate (62%, DM basis), protein (22%, DM basis), fat (2.4%, DM basis) and minerals (.89% Ca and .84% P, DM basis). Drouillard et al. (1999) reported that this isolated soy protein by-product appeared to have a feed value similar to or greater than soybean meal when fed in a finishing diet. We hypothesized that NXP25 could replace molasses and a portion of the SBM in diets fed to finishing steers. Therefore, our objective was to determine the effect of feeding NXP25 as a liquid feed ingredient on finishing performance and carcass characteristics of feedlot cattle.

Key Words: Carcass Merit, Cattle, Feedlot Performance, Liquid Supplements, Soybean Processing

Materials and Methods

Seventy one Angus x Hereford steers (523 ± 57 lb) were delivered to the Willard Sparks Beef Research Center on October 30, 2002. On arrival, calves were individually weighed and ear tagged, vaccinated for Bovine Rhinotracheitis and Bovine Viral Syncytial Virus with 2 mL of Bovishield FP4+L5 (Pfizer, New York, NY), dewormed with 4.5 mL Ivomec Plus, and implanted with Component E-S (Intervet Inc., Millsboro, DE). On February 7, 2003, steers were re-implanted with Revalor-S (Hoechst Roussel Vet, Clinton, NJ). Steers were blocked by weight and randomly allocated within block to one of the nine pens (9 pens/treatment, 4 steers/pen). Pens were randomly allotted to treatments (Table 1). Steers were fed for 168 (Heavy block) or 189 (Light block) d.

Treatment diets are shown in Table 1. Diets were formulated to meet or exceed NRC (1996) nutrient requirements. Monensin (30 g/ton of diet) and tylosin (10 g/ton of diet) were fed. Steers were gradually adapted to their final treatment diet by offering 55, 65, 75, and 85% concentrate diets for 13, 8, 7, and 7 days each, respectively. Feed refused was weighed every 28 d. In addition, diet samples were collected, and DM content of the diets and dietary ingredients was determined. Diet and ingredient samples were composited by 28-d periods, dried in a forced-air oven, and ground in a Wiley mill to pass a 1-mm screen. Interim unshrunk BW was determined at 28-d intervals. Steers were harvested at a commercial facility. Hot carcass weight, external fat, internal fat, longissimus muscle area, marbling score, yield grade, and quality grade were determined.

Data for BW, dry matter intake, average daily gain, feed efficiency, hot carcass weight (HCW), carcass-adjusted variables (calculated using carcass-adjusted final weight, which was calculated as HCW/average dressing percent), and normally distributed carcass characteristics were analyzed as a randomized complete block design using the Proc Mixed procedure of SAS Release 8.02 (SAS Institute Inc., Cary, NC). Non-parametric USDA quality grade data were transformed using Friedman's test by listing the percentage of Choice and Select for each pen within a block and then analyzed as normally distributed data as above (Elam et al., 2003). Pen was the experimental unit. The model statement included treatment, and the random statement included block.

Results and Discussion

Feedlot performance is presented in Table 2. Across the feeding period, body weight was not affected ($P<.42$ to $P<.91$) by treatment. Similarly, there were no differences ($P<.29$ to $P<.87$) in average daily gain. From d 0 through finish, dry matter intake ($P<.61$) and feed:gain ($P<.70$) did not differ among treatments. Similarly, feeding NXP25 did not influence carcass adjusted performance (Table 2).

Carcass data is shown in Table 3. No differences in hot carcass weight, dressing percentage, 12th-rib fat thickness, ribeye area, kidney-pelvic-heart fat, yield grade, or marbling score were observed among treatments. Carcasses from steers fed the control diet had greater ($P<.006$) percent Choice than steers fed the NXP25. Reasons for the lower quality grades by steers fed NXP25 are not evident.

Implications

In finishing diets, molasses and soybean meal can be replaced by isolated soy protein by-product with no effects on performance. Although marbling score was not influenced, NXP25 did decrease the percentage of cattle grading Choice in this experiment. Because hot carcass weight, ribeye area, and marbling scores were not affected, we conclude that isolated soy protein by product can be used as a liquid feed in finishing diets.

Table 1. Composition of final diets (DM basis)

Ingredient	Control	NXP25

Rolled corn	78.0	79.0
Alfalfa hay	10.0	10.0
Molasses	4.0	
NXP25		4.0
Fat	1.5	1.5
Soybean Meal 47.7	2.6	1.3
Urea	.8	.8
Limestone 38%	1.2	1.2
Salt	.25	.25
Rumensin 80	.019	.019
Tylan	.013	.013
Zinc Sulfate	.004	.003
Manganous oxide	.004	.004
Vitamin A-30,000	.011	.011
Availa-Zn 100	.029	.029
Potassium chloride	.12	
Vitamin E-50%	.002	.002
Availa-Cu 100	.002	.002
Wheat midds	1.446	1.867
Nutrient[a]		
NEm, Mcal/cwt	95.64	92.90
NEg, Mcal/cwt	61.95	60.14
Crude protein, %	12.8	13.0
NDF, %	16.2	18.1

ADF, %	7.70	8.12
Potassium, %	.81	.84
Calcium, %	.68	.67
Phosphorus, %	.29	.32
Magnesium, %	.17	.18
Sulfur, %	.18	.15
Cobalt, ppm	.07	.19
Copper, ppm	7.9	7.8
Iron, ppm	54.0	46.4
Manganese, ppm	41.2	42.3
Selenium, ppm	.15	.16
Zinc, ppm	60.8	61.6

[a]All values are calculated except CP, NDF, and ADF, which are actual

Table 2. Effect of NXP25 on performance by steers

Item	CON	NXP25	SEM	PR>F
Pens	9	9		
Steers	36	35		
BW, lb				
Initial	529	530	45	.91
d 27	666	660	52	.62
d 86 (reimplant)	910	897	59	.42
end	1249	1238	30	.57
Adj. end	1247	1241	31	.80
Daily gain, lb/d				

d 0-27	3.97	3.72	.19	.29
d 28-86	4.12	4.01	.14	.40
d 87-end	3.50	3.52	.11	.87
d 0-end	3.76	3.70	.13	.46
Adj. d 0-end	4.03	4.00	.16	.72
Dry matter intake, lb/d				
d 0-27	17.53	16.74	.87	.15
d 28-86	19.68	18.72	1.07	.15
d 87-end	21.48	21.99	.34	.25
d 0-end	20.29	20.08	.56	.61
Feed:gain				
d 0-27	4.48	4.60	.14	.56
d 28-86	4.79	4.69	.12	.45
d 87-end	6.15	6.28	.13	.50
d 0-end	5.39	5.43	.07	.70
Adj. d 0-end	5.02	5.02	.08	.97

[a]Adjusted final BW was calculated as hot carcass weight/average dress per weight block. Adjusted daily gain was calculated as (adjusted final BW − initial BW)/d on feed. Adjusted gain:feed was the ratio of adjusted daily gain and daily DMI

Table 3. Effect of NXP25 on carcass merit of steers

Item	CON	NXP25	SEM	PR>F
Pens	9	9		
Steers	36	35		
Hot carcass wt., kg	762	759	16	.79
Dress, %	61.0	61.3	.31	.51
12th-rib fat, in	.64	.65	.03	.83
Ribeye area, in^2	11.84	11.83	.53	.98

KPH, %	2.39	2.32	.11	.64
Yield grade	3.65	3.62	.12	.87
Marbling[a]	47.4	45.8	3.75	.33
Choice, %	83.3	57.4	5.76	.006
Select, %	16.7	42.6	5.76	.006

[a]30 = Slight, 4 = Small

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