Diverse Diets for Field Peas in Feedlots

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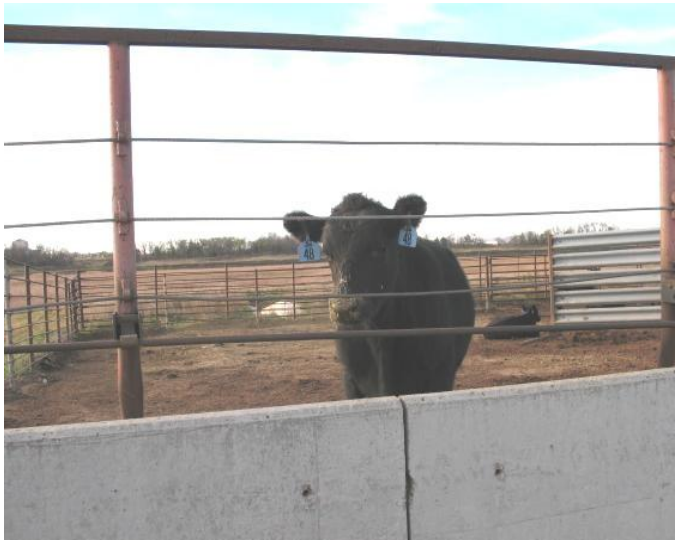
Introduction

Field peas have been proven to be a very useful feed grain for beef cattle in all stages of production (Anderson et al. 2007). Previous feedlot research addressed the use of field peas in corn-based finishing diets (Anderson et al. 2006). Field peas are grown in the same regions and climatic conditions as barley but there has been no research to investigate diets containing these two grains as the primary concentrates.

There is increasing availability of distillers grains from the ethanol production throughout the region. This feed may offer a distinct advantage when included in the barley-field pea diets. Dry distillers grains contain high levels of rumen-undegradable protein and a highly digestible fiber fraction that may improve the animal performance if included in the barley-field pea diets.

The objective of this trial was to compare animal performance and carcass traits from feeding field peas with barley, and field peas with corn, and the effects of including distillers grains as a source of digestible fiber and rumen-undegradable protein.



Black steer from the diverse diet trial at the bunk.

Materials and Methods

One hundred twenty-five yearling steers (initial weight 1043.8 pounds) where purchased at a public livestock auction market and transported to the Carrington Research Extension Center in the summer of 2007. The steers were weighed and randomized into 16 pens with seven or eight head per pen. Four pens were assigned to each of four treatments. Treatments were diets formulated primarily with field peas and barley (PB), field peas and corn (PC), field peas, barley and distillers grains (PBD), and field peas, corn, and distillers grains (PCD). Ration formulations are found in Table 1. The finishing rations were formulated with 85% concentrate (62 Mcal/lb) and met or exceeded nutrient requirements (NRC, 2000) with the exception of the PB diet that was low in by-pass protein. The supplement included an ionophore (Rumensin®) at 300mg/hd/day, added calcium to balance the high phosphorous in the ration and other minerals and vitamins. Cattle were fed once daily in fenceline bunks and had free access to waterers. Steers were weighed approximately every 28 days to monitor progress and determine relative performance during the trial. Steer growth performance parameters measured during the trial included feed intake, gain, and feed efficiency.

Table 1. Rations feed to steers comparision of field peas with barley, corn and DDGs.

Ingredient	Treatment			
	Peas Barley (PB)	Peas Barley DDGs (PBD)	Peas Corn (PC)	Peas Corn DDGs (PCD)
	---------- Percent - Dry Matter basis ----------			
Straw	12	12	12	12
Corn	-	-	52	54
Barley	65	59	-	-
Field Peas	15	6	28	11
Dried Dist Grains	0	15	0	15
Cond separator by-product	5	5	5	5
Ionophore supplement	2	2	2	2
Calcium carbonate	1	1	1	1
Ration Dry Matter, %	83.92	71.59	81.92	70.12
Crude Protein, %	13.78	15.40	13.00	13.74
NEg	60.02	60.05	62.49	62.36
Ca, %	0.67	0.66	0.64	0.63
P, %	0.41	0.40	0.37	0.36
K, %	0.66	0.66	0.65	0.61

Cattle were marketed the fall of 2007 to a commercial abattoir (Tyson Fresh Meats, Dakota City, NE) when it was determined 60% had reached USDA Choice grade by visual appraisal. Carcass traits measured and compared included hot carcass weight (HCW), marbling score, dressing percent, ribeye area, yield grade, fat thickness, and kidney pelvic and heart fat (KPH).

Animals were fed and cared for in accordance with Institutional Animal Care and Use committee of NDSU. Data were analyzed using SAS Mixed procedures with pen as the experimental unit.

Results

Treatment averages for steer weights, dry matter intake (DMI) and average daily gain (ADG) are found in Table 2. Body weights throughout the trial were not statistically different among treatments ($P > 0.60$). Dry matter intake during period 1 was similar for PB and PBD treatments (25.12, 24.88 pounds). However, PC steers ate significantly more ($P < 0.10$; 27.91 pounds) with PCD intermediate (27.02 pounds). During period 2, DMI was similar between the two barley diets and between the two corn diets. However, calves fed PC and PCD ate more than PB ($P < 0.10$; 29.44, 29.75 vs. 26.66 pounds, respectively). PBD DMI was intermediate (28.69 lbs./hd/d). During period 3, DMI did not differ due to treatment ($P = 0.23$). Over the entire study, DMI was greatest ($P < 0.10$) for the PC (28.75 pounds) followed by PCD (28.16) and PBD (27.06) with PB consuming the least DM (26.06 pounds). Average daily gain for period 1 and 2 were not different due to treatment ($P = 0.20$). During period 3, however, ADG was greatest for the steers on PC treatment ($P < 0.10$; 3.79 pounds). Overall ADG was not significantly different due to treatment. Feed per gain or gain per unit feed (Table 3) were not different due to treatment ($P > 0.30$).

Table 2. Feedlot performance of steers fed field peas with barley, corn, and distillers grains.

	Treatment					
	Peas-Barley	Peas-Barley-DDGS	Peas-Corn	Peas-Corn-DDGS	St. Error	*P* Value
Weight, lbs.						
Initial Wt.	1034.30	1050.50	1049.60	1040.91	24.66	0.959
Wt. 2	1114.32	1135.14	1135.00	1128.11	26.87	0.939
Wt. 3	1240.33	1264.40	1274.23	1260.38	29.46	0.871
Wt. 4	1312.50	1336.38	1368.86	1332.86	29.25	0.601
Dry Matter Intake, lbs./hd/day						
Period 1	25.12[a]	24.88[a]	27.91[b]	27.02[ab]	0.76	0.041
Period 2	26.66[a]	28.69[ab]	29.44[b]	29.75[b]	0.70	0.036
Period 3	26.53	27.91	29.02	27.80	0.80	0.232
Overall	26.06[a]	27.06[ab]	28.75[b]	28.16[ab]	0.62	0.043
Average Daily Gain, lb./hd/day						
Period 1	2.67	2.82	2.85	2.91	0.35	0.967
Period 2	4.67	4.79	5.16	4.99	0.26	0.604
Period 3	2.93[a]	2.88[a]	3.79[b]	2.91[a]	0.27	0.089
Overall	3.42	3.50	3.93	3.57	0.17	0.200

[ab] Values with different superscripts are significantly different ($P < .10$)

Table 3. Feedlot efficiency of steers fed field peas with barley, corn, and distillers grains.

	Treatment					
	Peas-Barley	Peas-Barley-DDGS	Peas-Corn	Peas-Corn-DDGS	St. Error	*P* Value
Feed per Gain (Feed Efficiency)						
Period 1	9.46	9.47	10.54	9.53	1.18	0.895
Period 2	5.79	6.03	5.72	6.09	0.23	0.623
Period 3	9.19	10.02	7.75	9.95	0.90	0.304
Overall	7.64	7.80	7.36	7.91	0.32	0.658
Gain per Feed (Gain Efficiency)						
Period 1	0.11	0.11	0.10	0.11	0.01	0.919
Period 2	0.17	0.17	0.18	0.17	0.01	0.665
Period 3	0.11	0.10	0.13	0.10	0.01	0.191
Overall	0.13	0.13	0.14	0.13	0.01	0.653

Treatment averages for carcass quality traits are found in Table 4. Steers' final live weight were similar among treatments ($P = 0.60$) however hot carcass weights (HCW) were significantly ($P < 0.10$) affected by treatment diet. Field peas and barley (PB) treatment HCW was significantly less than the PC treatment (956.43 vs. 993.98 pounds). The two treatments that included DDGS were intermediate and similar (979.98, 982.86 pounds for PBD and PCD, respectively). Dressing percent was statistically greater ($P < 0.01$) for PCD (62.99) than for PB (61.81) with PBD and PC intermediate. (62.47, 62.22). Ribeye area was greatest ($P = 0.01$) for PB and PC (13.94, 13.78 sq in. respectively) than PBD; (13.21 sq in.) with PCD intermediate (13.60 sq in.). Marbling score, Yield Grade, back fat and KPH were not different for all treatments ($P > 0.32$).

Table 4. Carcass quality traits of steers fed field peas with barley, corn, and distillers grains.						
	Treatment					
	Peas-Barley	Peas-Barley-DDGS	Peas-Corn	Peas-Corn-DDGS	St. Error	*P* Value
Item						
Final Wt, lbs	1312.50	1336.38	1368.86	1332.86	29.25	0.601
Hot Carcass Wt, lbs	956.43[a]	979.98[ab]	993.98[b]	982.86[ab]	137.06	0.056
Marbling Score*	485.16	446.00	482.07	484.19	18.42	0.383
Dressing percent	61.81[a]	62.47[ab]	62.22[ab]	62.99[b]	0.24	0.008
Ribeye area, square in.	13.94[a]	13.21[b]	13.78[a]	13.60[ab]	0.15	0.009
Yield Grade**	3.36	3.51	3.50	3.50	0.43	0.317
Back Fat	0.75	0.80	0.79	0.80	0.31	0.339
KPH, %	2.34	2.43	2.41	2.39	0.41	0.392
* Marbling score is numeric value based on dispersion of fat inside ribeye muscle,						
300-399=select, 400-499=low choice. Higher scores = more marbling and higher carcass value.						
** Yield grade is a measure of fat to lean ratio, 1 = lean, 5 = fat.						
[ab] Values with different superscripts are significantly different ($P < .10$)						

In this and other studies, it is apparent that corn and field peas compliment each other very well for feed intake and gain. Starch from field peas ferments slowly but very thoroughly in the rumen while starch from corn digests in both the rumen and lower gut. Protein from field peas also degrades very thoroughly in the rumen but corn protein contains a higher proportion of rumen undegradable protein. Barley and field peas tend to digest thoroughly in the rumen providing more nitrogen in the rumen than the animal can use, and less escape protein that supports high levels of growth. Barley is known for its rapid fermentation rate and potential for causing digestive upsets such as acidosis and there appears to be some mediation of this with the addition of DDG. Given competitive prices for these commodities, feeding corn with peas appears to support excellent gains.

Implications

Corn and field peas remain very compatible as the primary concentrates in feedlot diets. Barley and field peas had no negative effects on performance or carcass quality. The inclusion of DDGS in barley-field pea-based diets increased the rumen undegradable protein further balancing the ration and escalating performance compared to barley and field pea fed alone in the feedlot diet.

References

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