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Effects of Field Peas in Beef Finishing Diets

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Summary

Feeding field peas was compared to using corn in beef finishing diets. Diets containing field peas at 0%, 20%, 40%, and 59% replacement of corn in ration DM were fed to 129 steers. Dry matter intake increased from the 0% to 40% diets, but decreased when 59% peas replaced corn compared to 40%. No significant differences in ADG and G:F were observed. Field peas can replace 59% of the corn DM in beef finishing diet with no significant differences in animal gain or feed efficiency.

Introduction

Acreages of field peas (*Pisum savitum*) have increased markedly in recent years as field peas have become a valuable part of dryland crop rotations. Most field peas are grown for human consumption, however, the peas must meet strict quality grade standards for the human market. The rejected peas are much lower in dollar value and consequently are available for livestock consumption. Field peas contain 20-28% CP and one-third less starch than corn, which would indicate possibly a lower feeding value when protein needs are met. The objectives for our study were to determine the optimum level of field pea inclusion in a corn-based finishing diet and to compare the feeding of peas to corn.

Procedure

One-hundred-and-twenty-nine crossbred yearling steers weighing 799 lb were stratified by weight and randomly assigned to 16 pens with four pens randomly assigned to four treatments. Two consecutive day weights were taken for an initial weight. Single day weights were taken at 28-day intervals. Final weights were calculated from hot carcass weight by dividing carcass weight by 63%. Periodic feed and bunk samples were collected. The steers were on feed 143 days (5/24/03 to 10/13/03). Field peas replaced corn in the diet at 0%, 20%, 40%, and 59% (Table 1). The field peas were fed unprocessed. Two supplements were used with different levels of protein as the level of peas increased. One of the supplements contained 58% protein (38% from non protein nitrogen) (NPN) while the other was 10% protein with no NPN. The peas provided all the required protein in the diet of 40% and 59% field peas. Diets were calculated to contain 12.5%, 14.0%, 15.5%, 17.0% protein for 0%, 20%, 40%, and 59% diets, respectively. In the 20% pea diet a combination of two supplements was used to meet the required protein and monensin levels. Levels of monensin, vitamins, and trace minerals were constant in all experimental diets. The cattle were started on a 50 NEg diet and three steps were made to the final ration. The full level of peas (40% and 59%) was not achieved until the cattle were on the final finishing diet. All cattle were implanted with Synovex Plus® at the initiation of the trial plus treated for internal and external parasites. The data were analyzed in SAS using the Proc Mixed procedure with linear and quadratic contrasts. Mean with $P < 0.05$ were considered significantly different.

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Table 1. Experimental dry matter composition of rations containing four levels of peas[a].

	Peas			
Ingredient	0%	20%	40%	59%
Corn Silage	10.80	10.80	10.60	10.00
Dry Rolled corn	82.00	64.77	46.12	27.72
Peas		20.00	40.00	59.00
Supp A[b]	7.20	2.10		
Supp B[c]		1.80	2.60	2.60
Limestone		0.53	0.68	0.68

[a]Treatments are the percent of peas replacing corn on a DM basis.
[b]Supp A contained 58% crude protein.
[c]Supp B contained 10% crude protein.

Results

Cattle performance data is shown in Table 2. Dry matter intakes were significantly different (quadratic effect $P < .0001$). Intakes increased from 0% to 40% and decreased from 59% to 40%. It is not clear why intakes were higher at the low level pea diets yet dropped off at the higher levels. There did not appear to be any separation in the bunk so it is doubtful that palatability was greatly different between peas and corn. Because the level of starch is lower in peas than in corn, the higher intake of the pea diets may be explained by a possible increase in rumen pH as peas increased in the diet. This of course does not explain the peak intake at 40% peas rather than 59%, however, the intake at the high level of pea diet was still 1.5 lb higher than the corn control diet. The high level pea diets contained very high levels of protein which could have possibly moderated intake at the highest level. Bunk analysis of the diets found 12.7%, 14.3%, 16.2%, and 19.6% crude protein for the respective diets containing 0%, 20%, 40%, and 59% peas. Also, even though the NDF in all rations were relative low, if rumen pH was higher in the pea rations, NDF digestion could have been higher in the higher pea rations which would allow for greater intake.

There were no significant treatment differences among ADG and G:F ratios (Table 2). Numerically the control cattle were the most efficient because they had the lowest intake and the highest daily gain. In this experiment the control ration had 13.8% greater efficiency and although not statistically significant, it does suggest that further studies are needed to see if pea inclusions do lower efficiency and, if so, at what level.

Another factor suggesting that peas are of lower feeding value than corn, from an energy standpoint, was when the net energy value was estimated (Fred Owens Pioneer Brand Excel spreadsheet) in the overall diet and for peas. It was found that the value for peas was considerably lower than that for corn (Table 3). This was especially true with the lower level of inclusion. The estimated NEg level of the peas increased as the level in the diet increased. It is unclear why the estimates are greatly different at the different levels, but perhaps peas are influencing the overall diet digestion. Because the numerical differences in efficiency of the pea diets were nearly equal but greatly differed when compared to the corn diet, it is logical that the net energy value will be lowest at the lowest inclusion level. Reasons for the apparent negative associated effect are unclear, however, due to the fact that the feed efficiency means were not significantly different, it is probable the pea net energy values are estimated lower than actual values. It appears that when all factors are considered, the energy value of peas is somewhat lower than corn but the exact level is not clear in this experiment. No significant differences among treatments were observed for carcass variables (Table 4).

Replacing up to 59% of the diet DM with field peas produced similar animal gain, efficiency, and carcass quality with increased consumption to compensate for lower NEg content of the peas. Field peas have potential agronomic benefits for crop rotation in western Nebraska and the peas rejected from the human market can be fed with satisfactory results at high levels in finishing rations.

Table 2. Performance of finishing steers fed different levels of field peas[a].

	Peas				*P*-value	
Item	0%	20%	40%	59%	Linear	Quad
Initial wt, lb	810	799	806	799	0.8419	0.7891
Final wt, lb	1320	1288	1297	1294	0.1300	0.8447
DMI lb/day	21.0	22.9	23.1	22.5	0.0489	< .0001
ADG, lb	3.63	3.50	3.50	3.45	0.8719	0.4256
G:F	0.173	0.152	0.151	0.154	0.6002	0.2867

[a]Treatments are the percentage of peas replacing corn on a DM basis.

Table 3. Calculated net energy values Mcal/lb (Fred Owens, Pioneer Brand Excel Spreadsheet) for overall diets and peas in the diet[a].

	Peas			
Item	0%	20%	40%	59%
Diet NEg	.65	.57	.55	.58
Field Pea NEg	—	.17	.44	.56

[a]Treatments are the percentage of peas replacing corn on a DM basis.

Table 4. Carcass data of finishing steers fed different levels of peas[a].

	Peas				*P*-value	
Item	0%	20%	40%	59%	Linear	Quad
Hot wt, lb	831.8	811.4	816.8	815.3	0.3821	0.3968
Marbling score[b]	5.34	5.13	5.39	5.12	0.6825	0.8857
Fat, in.	0.51	0.47	0.48	0.52	0.6328	0.2063
Rib eye area, sq. in.	13.45	12.97	12.95	12.92	0.0748	0.2876

[a]Treatment is the amount of peas replacing the corn in the diet.
[b]Marbling score, 5.0 = small 0.

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