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2017

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Greenwell, Hannah L.; Jenkins, Karla; MacDonald, Jim C. Donald; and Luebbe, Matt K., "Evaluating the Impacts of Field Peas in Growing and Finishing Diets on Performance and Carcass Characteristics" (2017). *Nebraska Beef Cattle Reports*. 941.
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Evaluating the Impacts of Field Peas in Growing and Finishing Diets on Performance and Carcass Characteristics

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Summary with Implications

The impact of field peas as a grazing supplement and a component of finishing diets on performance and carcass characteristics was evaluated over two years. During grazing, cattle supplemented with field peas had a greater ending body weight and average daily gain than cattle that received no supplement. However, cattle supplemented with corn had greater average daily gain than both peas and control cattle. Overall, those cattle not supplemented during grazing compensated 53% and 88% when compared to those cattle supplemented corn and peas, respectively. Inclusion of field peas in grower supplement or finishing diets may be advantageous if appropriately priced as cattle supplemented field peas had more desirable performance on pasture than unsupplemented cattle, and inclusion of peas in the finisher did not affect performance.

Introduction

Field peas have increased in popularity in recent years with an 81% increase in production across the nation from 2011 to 2012. While a large component of this production is directed to the human consumption and pet food market, this also increases the availability of commodity level peas for the livestock feed market. Previous research has provided initial evidence that feeding field peas may positively affect sensory attributes, such as subjective and objective tenderness as well as flavor profile. Peas provide a viable rotation in wheat production because they fix nitrogen in the soil and naturally break up pest cycles. Determining the best use of field peas for the livestock sector is important for both the cattle producer and field pea farmer. The utility of field peas most likely fits the integrated crops and livestock producer more than commercial feedyards due to the limited bushels of peas produced for livestock feed at this time. Therefore, the objectives of this study were to determine the efficacy of field peas as a pasture supplement and to determine if feeding field peas during the grazing phase impacted carcass characteristics.

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Procedure

In Yr. 1, 114 steers (initial BW = 766 ± 48 lb) were used, and in Yr. 2, 114 heifers (initial BW = 548 ± 24 lb) were used in a 3 × 2 factorial experiment. Cattle were sorted into three weight blocks and randomly assigned to initial pasture. The first factor was three supplementation treatments applied during a summer grazing season. Supplementation occurred at a rate of 0.5% BW (DM Basis). The three treatments consisted of: 1) Whole, unprocessed field peas; (FP); 2) a mixture of dry rolled corn (DRC; 70.8%), solubles (24%), and urea (5.2%); (CMIX; the mixture was balanced to ensure RDP was not limiting); and 3) control group receiving no supplement (CON). Cattle grazed twelve 100 acre crested wheatgrass pastures at the High Plain Agriculture Lab (HPAL) near Sidney, NE. Cattle were rotated through pastures biweekly to ensure that pasture differences did not affect the treatments. In year 1 the grazing period was 117 days and in year 2, 142 days.

The second factor was two treatments assigned during finishing that occurred at the Panhandle Research and Extension Center (PREC) feedlot near Scottsbluff, NE. Cattle remained in their grazing groups across 12 pens and were fed a DRC-based finishing diet with or without 20% whole, unprocessed FP (DM basis). The complete composition of the finishing treatments is displayed in Table 1. Days on feed for both years were 119 and 131, respectively.

Cattle were slaughtered and carcass performance was evaluated at Tyson Foods in Lexington, NE. Data were analyzed using the MIXED procedure of SAS. The grazing and finishing models included treatment as a fixed effect with block and year as random effects.

Results

During the grazing phase ending BW and ADG ($P < 0.01$) were greatest for calves supplemented CMIX (909 lb, SED = 9.05; 1.96 ± 0.11 lb, respectively) followed by FP (878 lb, SED = 9.05; 1.72 ± 0.11 lb, respectively) and CON (834 lb, SED = 9.05; 1.36 ± 0.11 lb, respectively; Table 1). Due to unbalanced cattle numbers in pastures across years, standard error of the difference is being reported.

In the finishing phase there was an interaction between growing and finishing treatments for feed to gain (F:G; $P = 0.03$), a result of cattle supplemented with FP during the growing phase and with no FP in the finisher having improved feed conversion compared to cattle supplemented with FP during growing and with FP also included in their finishing diet (6.75 vs. 7.57, respectively; Table 2). The CMIX and FP cattle were most efficient when peas were not included in the finishing diet while the CON cattle were the most efficient when peas were included. When peas were not included in the finisher, only cattle supplemented with corn during the growing phase had reduced feed conversions.

Table 1. Finishing Diet Composition (DM Basis)

	Finishing Treatment	
Ingredient, %	No Peas	Peas
Dry-Rolled Corn	60.0	40.0
Field Peas	0.0	20.0
WDGS	20.0	20.0
Corn Silage	14.0	14.0
Mineral Supplement	6.0	6.0

Table 2. Effect of corn and pea supplementation on performance of growing calves

					P-value		
Treatment[1]	Control	Corn	Peas	SED[2]	Treatment	Year	Interaction
Initial BW, lb	656	654	654	3.44	0.84	0.10	0.91
Ending BW, lb	836[c]	910[a]	879[b]	9.50	<0.01	0.14	0.62
ADG, lb/d	1.36[c]	1.96[a]	1.72[b]	0.08	<0.01	0.14	0.34

[1] Treatments: Cattle grazed either without supplement or supplemented at 0.5% of body weight with either dry rolled corn or field peas.
[2] Due to unbalanced cattle numbers in pastures across years, standard error of the difference is being reported.
[abc] Within a row, means without a common superscript differ.

A possible explanation for this biological function is that the cattle supplemented on pasture entered the feedlot at a heavier initial body weight. This increase in weight would allow for more of their growth in the finishing phase to be a higher proportion of fat deposition. On the other hand, those cattle unsupplemented on pasture would experience a larger proportion of their growth as skeletal muscle development due to lower initial body weights in the finishing phase. Also, those cattle receiving peas in the feedlot would have lower diet starch content and perhaps less available energy for fat deposition.

There were no other interactions of finishing and growing treatments on other variables ($P \geq 0.10$). Feedlot ADG was affected by growing treatment ($P < 0.01$). Cattle in the CON treatment had greater ADG (4.29 ± 0.09 lb) than cattle supplemented CMIX (3.96 ± 0.09 lb) and FP (3.92 ± 0.09 lb), which were similar. Final BW and HCW tended ($P = 0.07$) to be affected by growing treatment in a similar manner to feedlot ADG. Inclusion of FP in the finishing diet had no impact on carcass characteristics. Cattle supplemented CMIX during grazing had greater ADG than cattle supplemented FP or CON. However, in the finishing phase, CON cattle compensated 53% compared to cattle supplemented CMIX and 88% compared to cattle supplement FP during grazing.

Conclusion

Field peas can be an alternative protein supplement option for grazing cattle on cool season pasture as cattle will potentially perform better than those cattle receiving no supplement. Improved performance could be explained from results in a companion study in which field peas increased dry matter intake and organic matter digestibility in diets with high and low quality forages (2017 Nebraska Beef Cattle Report, pp. 38–39). In finishing diets, field pea inclusion will not affect performance up to 20% inclusion rate. However, cattle receiving supplement on grass may gain less during the finishing phase, demonstrating the impacts of compensatory gain.

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Table 3. Effect of field peas on performance in finishing diets

Finishing trt[1]	No peas			Peas			*P*-value			
Growing trt[2]	Control	Corn	Peas	Control	Corn	Peas	SED[8]	Growing	Finishing	Interaction
Initial BW, lb[3]	846	906	873	824	912	889	14.59	<0.01	0.97	0.18
Final BW, lb[4]	1369	1396	1378	1371	1413	1371	23.43	0.07	0.74	0.77
ADG, lb[5]	4.20	3.89	4.07	4.37	4.03	3.81	0.15	<0.01	0.84	0.10
DMI, lb	29.4	29.2	28.7	29.8	29.5	29.4	0.63	0.39	0.19	0.88
F:G, lb:lb	6.99[ab]	7.41[c]	7.04[ab]	6.75[a]	7.30[bc]	7.57[c]	-	-	0.60	0.03
Carcass Performance										
HCW, lb	862	880	868	864	890	864	14.77	0.07	0.73	0.77
12th Rib fat, in.	0.53	0.58	0.56	0.57	0.55	0.59	0.04	0.68	0.61	0.36
Ribeye area, in^2	14.1	13.7	13.8	13.4	13.9	13.6	0.35	0.89	0.18	0.20
Marbling[6]	486	504	499	525	493	482	29.04	0.75	0.81	0.31
Calculated YG[7]	3.10	3.41	3.25	3.40	3.29	3.43	0.19	0.69	0.27	0.26

[1] Finishing Treatment: Cattle with peas in the diet had 20% of the dry matter of the diet as peas (by displacing dry rolled corn). The "No Peas" diet still included that 20% as dry rolled corn.
[2] Growing Treatment: Cattle were grazed for 142 days either without supplement or supplemented at 0.5% of body weight with either dry rolled corn or field peas depending on assigned treatment.
[3] Initial BW: Values differ across treatments because cattle were carried over from the growing phase to evaluate effect of growing treatment in the finishing phase.
[4] Final BW: Calculated as HCW ÷ 0.63
[5] ADG: Results in the finishing phase were affected by growing treatment.
[6] Marbling: 400 = $Slight^{00}$: 500 = $Small^{00}$
[7] Calculated Yield Grade: 2.50 + (2.5 × 12th Rib Fat, in.)–(0.32 × REA, in^2) + (0.2 × 2.5) + (0.0038 × HCW, lb)
[8] Due to unbalanced cattle numbers in pastures across years, standard error of the difference is being reported.
[abcd] Within a row, means without a common superscript differ.