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Sensory Attributes of Beef from Steers Fed Field Peas

Jeremy H. Hinkle
University of Nebraska-Lincoln, jeremeyhinkle@gmail.com

Judson Vasconcelos
University of Nebraska-Lincoln, jvasconcelos2@unl.edu

Stephanie A. Furman
University of Nebraska-Lincoln, sfurman2@unl.edu

Amilton S. de Mello Jr.
University of Nebraska-Lincoln, amilton@cabnr.unr.edu

Lasika S. Senaratne
University of Nebraska-Lincoln, lasikass@yahoo.com

See next page for additional authors

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Jeremy B. Hinkle
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Amilton S. de Mello Jr.
Lasika S. Senaratne
Siroj Pokharel
Chris R. Calkins[1]

Summary

Field peas were fed at inclusion rates of 0, 10, 20 and 30% (DM basis) to 139 yearling steers (initial BW = 900 ± 68 lb). Choice grade strip loins and carcass data were collected from the Tyson Fresh Meats Plant in Lexington, Neb. Consumer sensory ratings and Warner-Bratzler shear force data were collected. Feeding field peas caused a cubic response in overall like (P = 0.009), tenderness (P = 0.006), and flavor desirability ratings (P = 0.06), with the highest (most desirable) ratings occurring with 30% field peas. Shear force decreased linearly (P = 0.02) as field peas increased in the diet. These data indicate field peas increased tenderness and sensory attributes. Peas also improved the flavor of the beef. Field peas could be fed to cattle and give positive attributes to the quality of the meat up to 30% inclusion in the diet.

Introduction

Field pea (*Pisum sativum*) production is increasing rapidly in the Northern High Plains, increasing interest for use in feeder cattle diets. Limited data are available on the effects on meat quality of finishing cattle with field peas. Data from North Dakota State University suggest that increasing levels of field peas in finishing diets may decrease Warner-Bratzler shear force and increase tenderness and juiciness of beef. The objective of this study was to evaluate the effects of the inclusion of different levels of field peas in feedlot finishing diets on performance, carcass characteristic, tenderness, and taste panel ratings.

Table 1. Composition of finishing diets containing different levels of field peas.

	Treatment[1]			
	0	10	20	30
Ingredients				
Corn silage, %	10.00	10.00	10.00	10.00
Dry rolled corn, %	83.82	73.82	63.82	53.82
Field peas, %	0.00	10.00	20.00	30.00
Supplement, %	6.18	6.18	6.18	6.18
Formulated composition				
Dry matter, %	69.00	71.00	73.00	71.00
CP, %	12.20	13.84	15.48	17.12
Ca, %	0.66	0.68	0.69	0.70
P, %	0.30	0.31	0.32	0.34

[1]Treatments 0, 10, 20, and 30 = 0, 10, 20, and 30% field peas in the finishing diets (DM basis).

Procedure

Field peas were fed to 139 yearling steers (British cross; initial BW = 900 ± 68 lb) with inclusion rates of 0, 10, 20 and 30% (DM basis) at the University of Nebraska Panhandle Research and Extension Center. Cattle were stratified by BW and assigned to one of sixteen pens (8 to 9 steers per pen). Dietary treatments are presented in Table 1. On day 1, which occurred after a 21-day adaptation period, steers received a single implant of TE-S with Tylan (VetLife, West Des Moines, Iowa). Cattle were fed for 119 days.

Cattle were slaughtered at the Tyson Fresh Meats plant in Lexington, Neb. The carcass data from this trial were collected by Cattlemen's Carcass Data Service (West Texas A&M University, Canyon, Tex.). Hot carcass weight measurements were taken on the day of slaughter. Carcass 12th rib back fat thickness, percentage of kidney, heart, and pelvic fat (KPH), marbling score, LM area, and USDA yield grade were recorded following a 48-hour carcass chill. Animal performance and carcass data were analyzed using the MIXED procedures of SAS (SAS Inst. Inc., Cary, N.C.) as a randomized complete block design with pen as the experimental unit. Orthogonal contrasts included the evaluation of linear, quadratic, and cubic effects of increasing levels of field peas.

Ninety-eight Choice grade short loins were collected. The short loins were cut into 1-inch steaks after 17 days of aging and then packaged and frozen. Steaks were shipped to the University of Florida for consumer sensory evaluation of flavor, juiciness and tenderness. Steaks were cooked on a Hamilton-Beach table top grill to 160°F and served to 32 panelists per session. The remaining steaks were cooked and sheared at University of Nebraska–Lincoln. Steaks were thoroughly thawed for 24 hours prior to being cooked to an internal temperature of 160°F on a Hamilton Beach indoor-outdoor grill, turning over once at 95°F, until they reached an internal temperature of 160°F. Internal temperature was monitored using an OMEGA thermometer (Model 450A, OMEGA Engineering Inc., Stamford, Conn.) with a type T thermocouple and chilled overnight in the cooler. The steaks were allowed to cool overnight prior to coring and shearing. Shearing was performed on an Instron universal testing machine using a Warner-Bratzler shear force attachment. Shear force data were analyzed as a completely randomized design, with animal as the experimental unit. ANOVA and means separation were performed by PROC GLIMMIX, LSMEANS and DIFF functions of SAS.

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Results and Discussion

Performance data are presented in Table 2. No differences ($P > 0.10$) were observed for final BW, ADG, and DMI of steers. Carcass data are presented in Table 3. No differences ($P > 0.10$) were observed for carcass characteristics, except for a cubic ($P = 0.05$) effect on calculated yield grade. No differences were observed on the distribution of percentage of cattle grading USDA Choice ($P > 0.10$; Table 4).

Shear force decreased linearly ($P = 0.02$) as field peas increased in the diet (Table 5), with the lowest shear force value occurring at the highest level of peas. Similarly, feeding field peas caused a cubic response in consumer panelists ratings for overall like ($P = 0.009$), tenderness ($P = 0.006$), and flavor desirability ($P = 0.06$); in all cases the highest (most desirable) ratings were observed with field peas at the 30% inclusion level. These data indicate field peas increased tenderness and sensory attributes. Field peas could be fed to cattle and give positive attributes to the quality of the meat up to 30% inclusion in the diet.

[1] Jeremy B. Hinkle, graduate student, Judson T. Vasconcelos, assistant professor, Stephanie Furman, research manager, Panhandle Research and Extension Center; Amilton S. de Mello Jr, Lasika S. Senaratne, Siroj Pokharel, graduate students, Chris R. Calkins, professor, Animal Science, University of Nebraska, Lincoln, Neb.

Table 2. Effects of different levels of field pea grains on performance of beef steers.

	Treatment[1]					*P* - value[2]		
Item	0	10	20	30	SE[3]	L	Q	C
Initial BW, lb	905	894	896	906	32	0.07	0.46	0.87
Final BW, lb	1445	1467	1447	1457	34	0.67	0.45	0.32
ADG, lb	4.53	4.81	4.63	4.64	0.13	0.37	0.54	0.29
DMI, lb/d	27.11	27.53	26.89	26.49	0.71	0.17	0.84	0.98
F:G	6.00	5.73	5.81	5.73	0.19	0.99	0.66	0.28

[1]Treatments 0, 10, 20, and 30 = 0, 10, 20, and 30% field peas in the finishing diets (DM basis).
[2]Observed significance levels for orthogonal contrasts: L= linear effects of increasing levels of field peas; Q = quadratic effects of increasing levels of field peas; and C = cubic effects of increasing levels of field peas.
[3]Standard error of treatment means, n = 4 pens/ treatment.

Table 3. Effects of different levels of field pea grains on carcass characteristics of beef steers.

	Treatment[1]					Contrast *P* - value[2]		
Item	0	10	20	30	SE[3]	L	Q	C
HCW, lb	882	904	888	912	23.9	0.68	0.27	0.13
Marbling[4]	487.2	467.2	464.2	479.3	13	0.46	0.52	0.82
Fat thickness, in	0.52	0.59	0.60	0.62	0.039	0.69	0.86	0.25
LM area, sq. in.	12.98	12.62	12.90	12.98	0.33	0.23	0.69	0.50
Yield grade	3.41	3.86	3.67	3.84	0.14	0.92	0.31	0.05

[1]Treatments 0, 10, 20, and 30 = 0, 10, 20, and 30% field peas in the finishing diets (DM basis).
[2]Observed significance levels for orthogonal contrasts: L= linear effects of increasing levels of field peas; Q = quadratic effects of increasing levels of field peas; and C = cubic effects of increasing levels of field peas.
[3]Standard error of treatment means, n = 4 pens/ treatment.
[4]Marbling score: 300 = Slight0; 400 = Small0; 500 = Modest0.

Table 4. Effects of different levels of field pea grains on distribution of percentage of cattle grading USDA Choice.

	Treatment[1]				*P* - value[2]		
Item	0	10	20	30	L	Q	C
Pr.[3] USDA choice	33.33	27.75	14.23	32.63	0.68	0.12	0.36
USDA choice	47.23	58.35	74.68	58.70	0.97	0.17	0.76
USDA select	19.43	13.88	11.10	8.68	0.52	0.92	0.50

[1]Treatments 0, 10, 20, and 30 = 0,10, 20, and 30% field peas in the finishing diets (DM basis).
[2]Observed significance levels for orthogonal contrasts: L= linear effects of increasing levels of field peas; Q = quadratic effects of increasing levels of field peas; and C = cubic effects of increasing levels of field peas.
[3]Pr. = Premium; upper 2/3 choice grade

Table 5. Sensorial attributes and WBSF of muscle *Longissimus dorsi* from steers fed peas[1].

	Treatments[2]						*P* – value[3]		
Item	0	10	20	30	SE[4]	*P-Value*	L	Q	C
Overall like	6.32	6.47	6.34	6.66	0.10	0.04	0.02	0.01	0.009
Tenderness	5.99	6.26	6.09	6.45	0.14	0.07	0.002	0.06	0.006
WB shear force, kg	3.95	3.87	3.65	3.61	0.12	0.14	0.02	0.86	0.58
Juiciness	5.73	5.78	5.72	6.02	0.14	0.30	0.67	0.64	0.50
Flavor	6.39	6.45	6.36	6.63	0.09	0.04	0.23	0.12	0.06

[1]Overall like (1 - dislike extremely, 9 - like extremely), Tenderness (1 - extremely tough, 9 - extremely tender), Juiciness (1 - extremely dry, 9 - extremely juicy), and Flavor (1 - dislike extremely, 9 - like extremely).
[2]Treatments 0, 10, 20, and 30 = 0, 10, 20, and 30% field peas in the finishing diets (DM basis).
[3]Observed significance levels for orthogonal contrasts: L= linear effects of increasing levels of field peas; Q = quadratic effects of increasing levels of field peas; and C = cubic effects of increasing levels of field peas.
[4]Standard error of the treatment means.