

COMPARISON OF SENSORY AND MEAT PROCESSING CHARACTERISTICS FROM FINISHED BEEF WITH AND WITHOUT rbST TREATMENT DURING THE STOCKER AND FINISHING PHASES.

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SUMMARY

Shoulder clods IMPS #114 and rib sections IMPS #103 were taken from the carcasses of 22 rbST treated and 22 non-treated U.S. Choice and Select angus x hereford steers. The purpose in collecting the IMPS cuts was to study the effects of rbST treatment of finishing steers on the resulting meat and meat products. Processing characteristics evaluated for frankfurters were; smokehouse yield (SY), final yield (FY), cooler shrink (CS), Hunter Lab values on the inside and outside of the product, penetrometer readings on uncooked (Penuc) and cooked (Penc) product, along with fracturability (Frct), hardness (Hrdns), cohesiveness (Cohsv) and guminess (gmns) determinations. Proximate analysis included protein (Prot), fat, moisture (Moist) and ash. Difference and descriptive sensory evaluations were also performed. The *trapezius*, *longissimus*, *latissimus*, *spinalis* and *complexus* muscles of the rib section were evaluated for pH, water holding capacity (WHC), salt soluble proteins content (SSP), collagen content (Col), emulsion capacity (EC), total protein (TP), cholesterol content (Chol) of muscle, shear analysis (Shr), difference and descriptive sensory testing. The experimental design was a completely randomized design (CRD) where analysis of variance (ANOVA) was used to analyze the data along with the least significant difference test (LSD) for mean separation for all variables except difference testing, which was determined to be significant/nonsignificant from table derived by Roessler et al. (1978). There were no differences ($P > .05$) between groups for any variable evaluated in the study.

INTRODUCTION

Recombinant bovine somatotropin (rbST) administered to cattle has been shown to increase ($P < .05$) average daily gain (ADG) and decrease ($P < .05$) feed intake (FI) of steers, thus improving feed per pound of gain (F/G) (Early et al., 1990). Along with the increases in growth, Eisemann et al. (1986a) demonstrated that the administration of rbST increased ($P < .05$) nitrogen retention which was an indication of an increase in protein synthesis. Eisemann et al. (1986b) demonstrated an increase ($P < .05$) in nonesterified fatty acids (NEFA) in the plasma of heifers treated with rbST. This increase in NEFA indicated an increase in the mobilization of stored fatty acids (FA) and thus an increase in the use of NEFA as an energy source. The work done in beef cattle administered rbST has been limited to effects on growth characteristics. It was our goal to examine the effects of rbST treatment on sensory and processing characteristics of beef.

MATERIALS AND METHODS

Forty-four steers were used during the finishing phase (10-15 months of age), with 22 being treated with rbST at a rate of 90 mg/wk administered by an osmotic pump placed intraperitoneally in each treated steer and 22 receiving no rbST treatment. The steers were slaughtered at approximately 500 Kg body weight. The IMPS #114 shoulder clods and IMPS #103 rib sections were collected 48 h post-mortem for evaluation. The clods and rib sections were vacuum packaged (1 bar) and frozen at -20°C until tested.

The clods were tempered to 3°C and trimmed of all visible fat and the beef fat was trimmed of all visible lean. The lean and fat were combined in the appropriate proportions to form the meat block, which was then chopped (with the remaining ingredients), stuffed, weighed and placed in the smokehouse. Fifteen minutes of drying at 52°C and 25% relative humidity (RH) preceded 20 min of smoking at 52°C and 25% RH. Once the frankfurters were smoked, they were cooked for 1.75 h to 2.25 h using a delta cook process to an internal product temperature of 77°C . The frankfurters, at this time, were automatically showered with cold water for 5 min. and weighed. The frankfurters were chilled overnight to an internal temperature of 3°C and weighed, also at this time the casings were removed and the frankfurters were vacuum packaged (1 bar) and stored at 3°C for 30 d. Smokehouse yields, final yields and cooler shrink were calculated. Penetrometer readings were taken on the cooked and uncooked product and Hunter Lab values were derived for the inside and outside of the product at 30 d. Fracturability, hardness, cohesiveness and guminess values were derived as described by Bourne (1978). Fat, protein, ash and moisture were analyzed as per AOAC (1990). Sensory evaluations were performed at 30 d by difference test (duo-trio test) and descriptive analysis with scaling (AMSA, 1978 and Roessler, 1978). The duo-trio test utilized 10 trained panelists with each panelist being presented with 4 sets of samples for evaluation. This procedure produced 40 observations of correct/incorrect responses. The descriptive analysis with scaling procedure utilized 5 trained panelists being presented with a maximum of 6 samples at 7 different settings over a 4 d period to evaluate the variables flavor (Flv), juiciness (Juic) and texture (Text). In both the difference and descriptive testing the frankfurters were prepared by boiling in water for 2 min, cutting samples into 2.0 cm sections and placing samples in styrofoam cups covered with aluminum foil to maintain approximately 68°C for evaluation.

The rib sections were sliced into 2.54 cm steaks beginning at the 12th rib, labeled by position in the section, wrapped and returned to the freezer. Testing was done on steaks from identical positions on the rib sections. Salt soluble protein (SP) was determined as described by Gornall et al. (1949), collagen analysis (Col) as described by Kolar, (1990), emulsion capacity (EC) as described by Carpenter and Saffle (1964) and Acton and Saffle (1969) and total protein (TP) as per AOAC (1990). WHC was a comparative evaluation by taking two 2.54 cm cores from like positions of the *longissimus* muscle of thawed steaks, removing a 3 mm slice from the middle of each core, placing the slice on number 4 Whatman filter paper, placing a glass petri dish under the filter paper and over the slice, placing a 1000 g weight on the slice for 1 min and measuring the area of absorbed liquid onto the filter paper. Shear data were obtained, using a Warner-Bratzler head mounted on an Instron device, from six 1.27 cm cores taken parallel to the muscle fiber from each cooked steak with the shear value being read in maximum Kg force. The pH was taken on thawed steaks by inserting a Orion model 81-63 pH probe into the *longissimus* muscle of the steak at two locations and recording the values. Eight rbST treated and eight non-treated samples having ribeye marbling scores of small were chosen for cholesterol content as per AOAC (1990). Difference (duo-trio test) and descriptive (descriptive analysis with scaling) test were used for sensory evaluations. The duo-trio test utilized 10 trained panelists with each panelist being presented with 3 sets of

samples at each of 2 settings, at one wk intervals. This procedure produced 60 observations of correct/incorrect responses. The descriptive analysis with scaling utilized 5 trained panelist being presented with a maximum of 6 samples at 8 different sittings over a period of 5 d to evaluate the variables flavor, juiciness and tenderness. The cooking procedure for shear and sensory evaluations was one of broiling the steaks at 232°C for 8 min on one side, turning and cooking to an internal temperature of 70°C. A degree of doneness score from 1 (rare) to 8 (well done) was given to the prepared steaks.

RESULTS AND DISCUSSION

The variables SY and FY (%), CS (%), penetrometer reading(grams force), Hunter Lab values, fat(%), Prot (%), ash(%), Moist (%), Frct (Kg), Hrdns (Kg), Cohsv and Gmns (Kg) for frankfurter processing showed no differences ($P>.05$) between the rbST treated and non-treated groups. Difference and descriptive testing also demonstrated no differences ($P>.05$) between rbST treated and non-treated groups. The variables SP (mg/g), Col (g/100g), EC, TP (%), WHC (cm^2), Chol (mg/100g) and Shr (Kg) for rib sections showed no differences ($P>.05$) between the rbST treated and non-treated groups. Difference and descriptive testing also demonstrated no differences ($P>.05$) between the rbST treated and non-treated groups. The results of the study indicate that there were no effects ($P>.05$) on the sensory and processing characteristics of beef originating from rbST treated steers as compared to analogous non-treated steers.

TABLE 1. VARIABE MEANS BY TREATMENT^a.

Clod				Hunter Internal			Hunter External			Penuc (grams)	Penc (grams)	
	SY (%)	FY (%)	Prge (%)	L	a	b	L	a	b			
rbST	90.6	89.6	.99	53.2	9.38	10.56	43.15	11.18	14.25	33.1	11.8	
cont	90.9	89.8	1.06	53.1	9.84	10.51	43.16	10.77	13.97	41.4	12.7	
Clod	Flv	Juic	Text	Frct (Kg)	Hrdns (Kg)	Cohsv	Gmns (Kg)	Prot (%)	Fat (%)	Moist (%)	Ash (%)	
rbST	9.74	9.12	7.72	19.1	138.3	.14	21.7	11.6	27.5	46.2	2.9	
cont	9.84	9.28	8.08	18.5	123.9	.18	21.9	11.6	27.4	46.4	2.8	
Rib	SSP (mg/g)	EC	Col (g/100g)	TP (%)	Tend	Flv	Juic	Shr (Kg)	WHC (cm^2)	pH	Cksc	Chol (mg/100g)
rbST	83.4	35.1	1.09	19.9	8.75	9.46	9.33	6.3	21.78	5.44	3.31	21.68
cont	76.9	32.0	1.10	20.1	9.38	9.47	9.49	5.9	22.11	5.46	3.22	29.35

a - there were no differences ($P>.05$) between treatments among any of the variables studied.

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