PE10.07 Cutting yields and value-added strategies for the beef round 414.00

Chris Calkins (1) ccalkins1@unl.edu, A Mata(2), K Underly (3), J Nelson (4), B Lobaugh (5), E Gibson(6), S Wald (6)
(1)University of Nebraska, Lincoln, NE, Unite States of America
(2)Mata Development Group, Colleyville, TX, Unite States of America
(3)Range, Inc., Chicago, IL, Unite States of America
(4)Oklahoma State University, Stillwater, OK, Unite States of America
(5)iQ Foods, Fayetteville, AR, Unite States of America
(6)Beef Innovations Group of the National Cattlemen's Beef Association, Englewood, CO 80112, Unite States of America

***Abstract*— To increase the value of the beef round in the United States it is necessary to have a clear understanding of the yields and properties of the key muscles which comprise the round. To quantify cutting yield, shank-off, partially boneless beef rounds (n = 29) from young, market-weight beef carcasses (carcass weight = 378.8 kg) were fabricated into the primary muscle groups and trimmed of all visible fat: cap-off and side muscle off, inside round (m. adductor and m. semimembranosus together; 17.7% of round weight), inside round cap and side muscles (m. gracilis, m. pectineus, and m. sartorius, independent of each other; 2.7, 1.3, 0.8%, respectively), outside round flat (m. biceps femoris, 19.1%), heel (m. gastrocnemius and m. superficial digital flexor together; 5.8%), eye of round (m. semitendinosus; 7.2%), and the knuckle (m. rectus femoris, m. vastus medialis, m. vastus intermedius, and m. vastus lateralis together; 13.4%). Based on published tenderness and sensory properties, and ease of access during fabrication, candidate muscles for upgrading include the m. gracilis, m. pectineus, m. sartorius, m. rectus femoris, and the m. adductor.**

A. Mata is with Mata Development Group, Colleyville, TX 76034 (Phone: 312-953-7281, e-mail: antonmata@aol.com).
J. L. Nelson is with Oklahoma State University, Stillwater, OK 74078 (e-mail: jacob.nelson@okstate.edu).
B. Lobaugh is with iQ Foods, Fayetteville, AR 72703 USA (e-mail: brandonlobaugh@gmail.com).
K. A. Underly is with Range, Inc., Chicago, IL 60607 (e-mail: Kari@rangepartners.com).
C. R. Calkins is with the Department of Animal Science, University of Nebraska, Lincoln, NE 68503 USA (e-mail: CCalkins1@unl.edu).
E. Gibson is with the Beef Innovations Group of the National Cattlemen's Beef Association, Englewood, CO 80112 USA (e-mail: EGibson@beef.org).
S. J. Wald is with the Beef Innovations Group of the National Cattlemen's Beef Association, Englewood, CO 80112 USA (e-mail: SWald@beef.org).

***Index Terms*— Beef round, Cutting yield, Value-added cuts.**

I. INTRODUCTION

MUSCLE profiling research conducted in 2000 revealed the tenderness and sensory properties of muscles from the beef round [1]. Round muscles possess unique properties that make them especially challenging to use for value-added beef items. They are lean, often high in connective tissue, and generally low in tenderness. To add value, separation of the various muscle groups into component muscles will likely be needed as muscles vary in their sensory traits. To facilitate fabrication of the beef round into cuts to which value can be added it is necessary to know the cutting yields. This research was conducted to quantify the cutting yield of specific muscles and muscle groups in the beef round. In addition, published tenderness and sensory properties have been combined with ease of fabrication and cutting yield information to suggest candidate muscles for value-adding procedures.

II. MATERIALS AND METHODS

Shank-off, semi-boneless beef rounds (NAMP no. 160 except the aitch bone was included, [2]; n = 29) from young, market-weight beef cattle (mean carcass weight = 378.8 kg) were fabricated into major muscle groups. The rounds had the following portions removed: tibia and muscles associated with the shank, aitchbone, sacral vertebra, the sacrosciatic ligament and the thick opaque portion of the gracilis membrane. Selected muscle groups were then further fabricated into individual muscles and denuded of all fat and heavy connective tissue. Muscle groups included the cap-off inside round (m. adductor and m. semimembranosus together), inside round cap and side muscles (m. gracilis, m. pectineus, and m. sartorius, together and independent of each other), outside round flat (m. biceps femoris), heel (m. gastrocnemius and m. superficial digital flexor together), eye of round (m. semitendinosus), and the knuckle (m. rectus femoris, m. vastus medialis, m. vastus intermedius, and m. vastus lateralis together). Means and standard deviations were calculated.

III. RESULTS AND DISCUSSION

Yields of the various muscle groups and selected individual muscles are presented in Table 1. The largest muscles groups in the round were the inside round (m. adductor and m. semimembranosus), the outside round flat (m. biceps femoris), and the beef knuckle (m. rectus femoris, m. vastus medialis, m. vastus intermedius,

and m. vastus lateralis). Most of these cuts already return good value and offer minimal opportunity to be increased in value, with two major exceptions. The outside round flat can be increased in value by removing the ischiatic head of the m. biceps femoris. Doing so creates a beef cut that is more uniform in size and shape, that can easily be cut into steaks by cutting across the grain, and provides an ease of use for retailers. The second opportunity is the central muscle of the beef knuckle. Published shear force values (Table 2) reveal the m. rectus femoris to be one of the top two most tender muscles in the round. This is a steak-quality muscle that merits exploration as a steak item, not just as a convenient beef roast.

Additional value can apparently be returned by separating the cap and side muscles from the inside round. This includes the m. gracilis, a wide, flat muscle with coarse texture. The tenderness data (Table 2) suggest this muscle could be used for specialized applications like fajita meat or even as a replacement for flank steak (m. rectus abdominis) which has high value in the United States. In removing the cap, the side muscles can also be removed from the inside round. The m. pectineus is tender and offers a strong opportunity for adding value. The m. sartorius, because of accessibility and consistency, could be used as a specialized beef cut or in the production of ground round, a popular and relatively high value product in the United States.

IV. CONCLUSION

On the basis of tenderness, sensory properties and ease of fabrication, several muscles in the round are candidates for development of value-added cuts. These include the m. gracilis, m. pectineus, m. sartorius, m. rectus femoris, and the m. adductor.

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Table 1. Mean weight and percentage of muscle groups in the beef round

Item	Muscle	Weight kg	Standard Deviation, kg	Percent of round	Standard Deviation, %
Round, shank-off, semi-boneless		32.66	3.15		
Inside round, cap off, side muscles off	m. a*dductor* and m. *semimembranosus*	5.77	0.82	17.65	1.46
Inside round cap	m. g*racilis*	0.89	0.19	2.72	0.42
Inside round cap - side muscle	m. p*ectineus*	0.42	0.07	1.30	0.18
Inside round cap - side muscle	m. s*artorius*	0.25	0.05	0.77	0.12
Outside round flat	m. b*iceps femoris*	5.36	0.71	16.37	0.89
Eye of round	m. s*emitendinosus*	2.35	0.40	7.18	0.90
Heel	m. g*astrocnemius* and m. s*uperficial digital flexor*	1.88	0.28	5.75	0.55
Knuckle	m. r*ectus femoris* and vastus muscles	4.36	0.50	13.35	0.80
Bone		3.26	0.41	9.98	0.85
Trim		7.00	1.01	21.54	3.10
Purge/cutting loss		1.11	0.21	3.38	0.53

Table 2. Published Warner-Bratzler shear force values for muscles from the beef round.

	Dry heat cookery		Moist heat cookery		
Muscle	Shear force, kg	Std Dev. kg	Shear force kg	Std Dev, kg	Source
m. a*dductor*	4.48	1.10	4.47	0.59	[3]
m. s*emimembranosus*	4.30	1.23	4.10	0.70	[3]
m. g*racilis*	4.12	0.81	3.67	0.61	[3]
m. p*ectineus*	3.70	0.65	4.27	0.73	[3]
m. s*artorius*	4.45	0.47	4.63	0.48	[3]
m. b*iceps femoris*	4.51	1.33	4.82	1.64	[3]
m. g*luteus medius*	6.04	1.14	5.12	1.28	[3]
m. s*emitendinosus*	4.72	0.84	5.02	0.72	[3]
m. r*ectus femoris*	3.65	0.75	3.81	0.65	[3]
m. v*astus medialis*	3.73	0.74	3.88	0.63	[3]
m. v*astus intermedius*	4.02	0.60	3.53	0.62	[3]
m. v*astus lateralis*	5.28	1.03	4.82	0.73	[3]
m. g*astrocnemius*	4.42	1.38	4.42	0.97	[4]