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Effect of Cut, Grade, and Class Upon Palatability and Composition of Beef Roasts

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Effect of Cut, Grade, and Class upon Palatability and Composition of Beef Roasts

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THE data in this bulletin are from two studies: (1) the effect of cut and (2) the effect of class and grade of beef upon press fluid, shear force, diameter of muscle fibers and number per bundle, total moisture, ether extract, total losses, and palatability scores of roasts.

MATERIALS

For the study of effect of cut, the longissimus dorsi (11-12th rib roast), triceps brachii (bread and butter cut), and adductor (round) muscles from the right side of six steers graded "high-medium to good" and seven cows graded "good" were used. The roasts from the 11-12th ribs averaged 5.9 pounds in weight; the bread and butter, 4.5 pounds, and the adductor, 5.0 pounds.

The study of the effect of class and grade involved two comparisons. First, the three cuts mentioned were averaged for each animal, and the two classes, the cows and steers, were compared; second, 15 animals from each of two market grades, medium and good heifers, were compared, using the adductor (round) and longissimus dorsi (11-12th rib) muscles. The meat was ripened 11 days at 2-3° C.

METHODS

All meat was prepared and cooked to 58° C. at 150° C. by the methods recommended by the Cooking Committee of the Cooperative Meat Investigations (1). When roasts had reached maximum temperature after removal from the oven, the fat and bone were removed and the muscle was halved through the thermometer hole across the muscle fiber. From the center of a slice 1.25 centimeters thick, two samples 1.25 centimeters in diameter were taken for press-fluid determination and the remainder of the slice was ground for chemical analysis. The rest of this half of the roast was used for muscle-fiber count and measurement. From the other half of the roast, two or three 1/8-inch slices were cut for judging and two cylindrical samples for shear-force determination, parallel to the muscle fibers, one inch in diameter and one and one-half to two inches long.

Press fluid.—Each sample cut for this purpose was wrapped in filter cloth and pressed ten minutes under a pressure of 250 pounds by the pressometer (see page 5), which was used by Child and

Acknowledgment: The authors wish to acknowledge the cooperation of the Division of Animal and Poultry Husbandry in making this study possible and to extend thanks to Dr. F. R. Immer, Division of Agronomy, for his helpful suggestions in the statistical treatment of the data.

[1] Died July 10, 1938.

Fogarty (4). The difference in weight of the meat before and after pressing was considered press fluid and was calculated as percentage of the cooked meat.

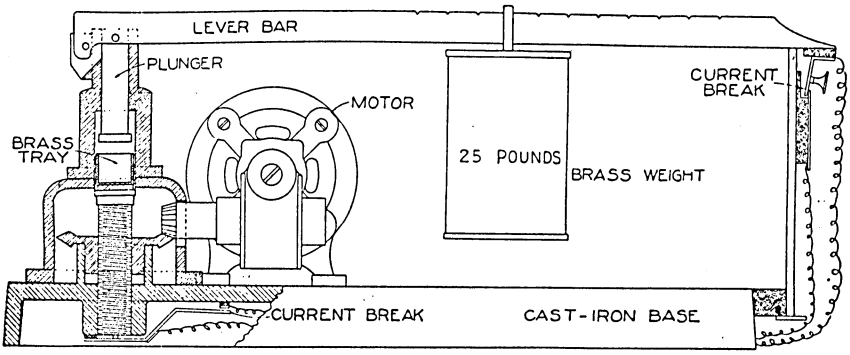

FIG. 1. CROSS SECTION OF THE PRESSOMETER, GIVING DETAILS OF WORKING MECHANISM

Shear force.—Each of the two samples of meat was sheared at the center and at the center of each half by the Minnesota modification (5) of the Warner-Bratzler shear-force apparatus (see page 13). The force necessary to shear the meat was recorded to the nearest one-fourth pound, and the six readings for each roast were averaged.

Chemical analysis.—The ground meat was used for determination of total moisture and ether extract. For total moisture, two 3- to 5-gram samples were dried two hours at 60° to 65° C. in an air oven and five hours at 100° C. under a pressure of 25 to 30 millimeters.

Ether extract was determined by the Soxhlet method (2) the first year of the work, but owing to poor checks a second method[2] was used for the remainder of the work. For the latter method, a 10-gram sample was rubbed with sand, dried overnight at 60 to 65° C. in an air oven, and extracted in a volumetric flask with petroleum ether at 40° C. for about 24 hours. Aliquot portions of the solution were dried at 100° C. and the percentage of material extracted from the original meat was calculated. The amount of material extracted by the two methods was compared on 12 samples of meat. The *"t"* test showed no difference in average amount extracted by the two methods, although poorer checks were obtained in the Soxhlet method.

Muscle-fiber measurements.[3]—The average number of fibers per bundle and the average diameter of the fibers were determined with the aid of an eyepiece micrometer as described by Brady (3).

Subjective judging.—The grading sheet (see page 16) developed

[2] Courtesy of Swift and Co., Chicago.

[3] Experimental work done by D. E. Brady, Animal Husbandry Division, University of Minnesota.

by the Cooperative Meat Investigations (1) was used, and the scores for four or five judges from the animal husbandry and home economics divisions were averaged. In the comparisons of grades, a score card was devised for grading the raw meat and also the external appearance of the cooked roasts (see pages 14 and 15).

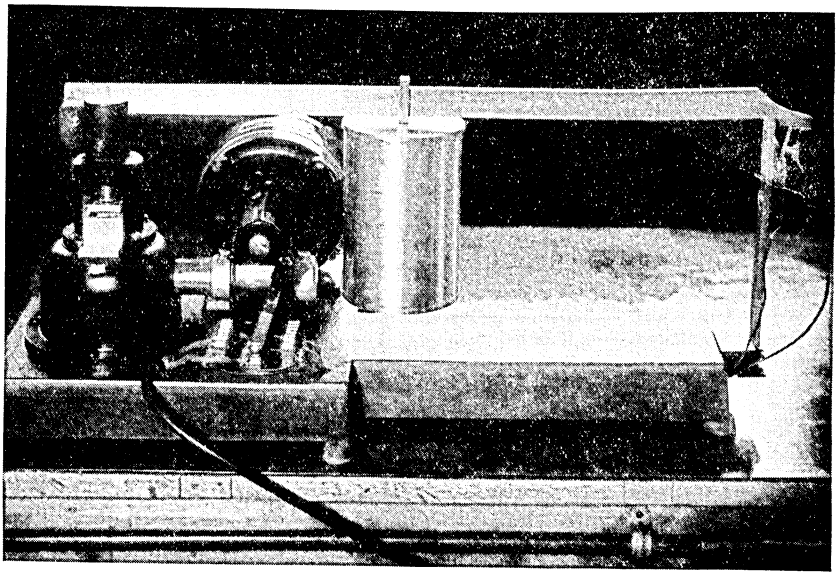

FIG. 2. THE PRESSOMETER

Statistical analysis.—The *"t"* test given by Fisher (6) was used to test the significance of differences among means. In the experiments with grades and with classes, the animals of the two groups compared were not pairs. Preliminary analysis showed that the results did not differ whether or not the data were paired. Thus, the series of 15 ainmals was paired for the comparison of grades; the series of 6 animals in the comparison of classes was not paired.

RESULTS

Effect of Cut on Meat

The physical measurements, i.e., press fluid, shear force, diameter of muscle fibers and number per bundle of the three cuts of beef, are given in Table 1. Press fluid content did not vary significantly among the three cuts. The triceps brachii and longissimus dorsi muscles did not differ in shear force, but the adductor muscle required more pounds of force to shear it than either of the other two—26.8 pounds as compared to 20.3 for the triceps brachii and 17.9 for the longissimus dorsi. The

Table 1. Percentage Press Fluid, Pounds Shear Force, Diameter (microns) and Number per Bundle of Muscle Fibers for Adductor, Triceps Brachii, and Longissimus Dorsi Muscles of Beef Cooked to 58° C. at 150° C.

Series No.	Press fluid			Shear force			Diameter muscle fibers			Number of fibers per bundle		
	Adductor	Triceps brachii	Longissimus dorsi	Adductor	Triceps brachii	Longissimus dorsi	Adductor	Triceps brachii	Longissimus dorsi	Adductor	Triceps brachii	Longissimus dorsi
	per cent (1)	per cent (2)	per cent (3)	pounds (1)	pounds (2)	pounds (3)	microns (1)	microns (2)	microns (3)	number (1)	number (2)	number (3)
1.	55.59	58.17	57.17	.....	.....	.....	49.35	48.76	55.81	153.02	277.98	293.10
2.	49.11	48.74	51.42	21.60	15.20	14.90	37.88	39.67	42.98	143.12	327.00	300.76
3.	59.11	56.88	54.66	20.10	20.80	14.20	53.68	50.79	51.05	134.14	251.02	232.12
4.	56.38	53.90	53.98	24.50	14.20	15.50	53.77	59.63	53.94	130.24	263.20	241.20
5.	51.46	55.64	56.04	17.30	14.80	10.00	50.28	44.93	47.91	147.04	271.20	302.94
6.	61.05	55.64	53.14	13.50	8.60	13.00	56.23	56.40	46.12	198.04	310.08	366.08
7.	54.02	46.84	52.76	26.38	18.81	19.96	69.83	61.51	61.74	121.16	218.20	295.82
8.	49.61	47.55	51.42	32.71	28.29	22.71	71.40	58.10	67.30	114.26	193.96	177.14
9.	53.22	56.61	57.02	36.54	21.25	24.55	63.59	58.88	62.63	110.78	272.98	218.08
10.	49.79	52.18	56.11	33.50	22.59	18.21	64.81	55.10	56.60	118.14	278.94	276.16
11.	54.49	53.75	55.87	37.21	27.27	17.09	56.92	49.97	68.41	151.02	228.26	210.96
12.	52.67	51.57	56.71	34.00	26.25	21.71	59.70	57.89	59.49	131.10	157.90	207.18
13.	57.70	59.33	55.91	24.71	25.21	23.33	65.27	58.14	63.34	123.02	246.78	266.18
Mean	54.17	53.60	54.79	26.84	20.27	17.93	58.61	54.25	56.79	135.17	251.63	257.89
	(1)–(2)	(2)–(3)	(1)–(3)	(1)–(2)	(2)–(3)	(1)–(3)	(1)–(2)	(2)–(3)	(1)–(3)	(1)–(2)	(2)–(3)	(1)–(3)
t	0.61	−1.41	−0.55	4.78**	1.85	5.56**	2.83**	−1.51	0.70	10.25**	0.65	11.04**

** Highly significant difference.

Table 2. Percentage Total Moisture, Ether Extract, Cooking Losses, and Total Scores of Judges for Adductor, Triceps Brachii, and Longissimus Dorsi Muscles of Beef Cooked to 58° C. at 150° C.

Series No.	Total moisture			Ether extract			Cooking losses			Total scores of judges		
	Adductor	Triceps brachii	Longissimus dorsi	Adductor	Triceps brachii	Longissimus dorsi	Adductor	Triceps brachii	Longissimus dorsi	Adductor	Triceps brachii	Longissimus dorsi
	per cent (1)	per cent (2)	per cent (3)	per cent (1)	per cent (2)	per cent (3)	per cent (1)	per cent (2)	per cent (3)	(1)	(2)	(3)
1.	69.21	69.89	70.46	2.85	4.09	3.39	13.11	10.00	8.43	68.00	71.25	69.50
2.	69.90	72.43	71.55	3.45	3.33	3.86	22.60	16.93	8.79	60.74	72.25	71.75
3.	71.95	75.12	69.85	3.00	3.22	3.61	14.38	10.23	9.15	69.13	66.50	65.25
4.	72.50	72.28	70.98	2.22	3.71	5.34	16.36	12.75	10.59	67.50	68.00	66.50
5.	72.88	73.96	73.06	2.89	3.34	4.30	15.73	12.52	8.98	67.50	65.83	68.00
6.	73.60	71.63	69.15	2.62	4.12	5.82	18.31	14.87	8.69	69.00	68.00	69.00
7.	70.72	69.85	69.32	2.65	3.81	5.11	15.75	14.73	8.80	53.40	60.40	59.60
8.	71.35	70.68	69.96	3.18	3.14	4.28	21.45	20.90	11.77	58.80	60.80	63.60
9.	70.27	71.55	67.47	3.95	4.13	8.95	17.15	14.74	12.32	54.00	56.75	58.75
10.	69.83	67.62	67.08	3.84	5.65	11.35	22.76	18.37	18.63	57.75	61.92	57.00
11.	70.09	71.01	70.50	3.44	4.79	6.40	18.38	16.25	10.39	56.20	60.00	58.40
12.	70.13	70.70	68.87	3.36	4.41	7.17	20.70	20.97	13.41	56.80	56.60	56.40
13.	63.61	70.42	66.99	7.91	7.65	11.81	20.49	15.65	14.07	50.75	54.75	60.00
Mean	70.46	71.32	69.63	3.49	4.26	6.26	18.24	15.30	11.08	60.74	63.31	63.37
	(1)–(2)	(2)–(3)	(1)–(3)	(1)–(2)	(2)–(3)	(1)–(3)	(1)–(2)	(2)–(3)	(1)–(3)	(1)–(2)	(2)–(3)	(1)–(3)
t	−1.29	3.62**	1.41	−3.87**	−3.87**	−4.89**	6.12**	4.98**	9.73**	−2.42*	−0.07	−2.19*

* Significant difference.

** Highly significant difference.

adductor muscle contained a smaller number of fibers per bundle than the longissimus dorsi or triceps brachii muscles, between which there was no difference. There were only 135 fibers per bundle for the adductor while there were 252 and 258, respectively, for the triceps brachii and longissimus dorsi muscles. The diameter of the muscle fibers of the longissimus dorsi and triceps brachii muscles did not differ. Although the fibers from the adductor muscle were found to be larger than those from the triceps brachii after the muscles had been cooked, Brady (3) found no difference in diameter of fiber among the longissimus dorsi, triceps brachii, and adductor muscles when the fresh, aged, and cooked muscles were averaged.

The chemical analysis, cooking losses, and palatability scores are shown in Table 2. There was no difference between the total moisture content of the adductor and longissimus dorsi muscles, nor between the adductor and triceps brachii muscles, but the triceps brachii contained more total moisture than the longissimus dorsi muscle. The adductor muscle contained the least ether-extractable material, 3.49 per cent, and the longissimus dorsi the most, 6.26 per cent. Cooking losses were greatest in the adductor muscle, 18.24 per cent, and least in the longissimus dorsi muscle, 11.08 per cent. It is interesting to note that cooking losses were highest in meat that contained the least amount of ether-extractable material in the muscle and also had the least surface fat. Total scores of judges showed that the adductor muscle was less palatable, with a score of 60.7, than either the longissimus dorsi or triceps brachii muscles, between which there was no difference and whose score was 63.3. The adductor muscle was graded lower in texture, tenderness, quality, and quantity of juice.

Effect of Class and Grade on Meat

Comparison of two classes.—Press-fluid content did not differ significantly between steers graded "high medium to good" and cows graded "good" (Table 3). The meat from steers, however, was much

Table 3. Chemical and Physical Measurements and Judges' Scores of Beef Cooked to 58° C. at 150° C. from Steers Graded "High Medium to Good" and Cows Graded "Good" (average of longissimus dorsi, triceps brachii, and adductor muscles)

Quality	Steers	Cows	*t*
Press fluid (per cent)	54.89	52.90	1.37
Shear force (pounds)	18.09	28.46	6.34**
Diameter muscle fibers (microns)	54.36	65.69	4.56**
Number of muscle fibers	210.04	165.08	3.25**
Total moisture (per cent)	72.94	71.34	2.62*
Ether extract (per cent)	3.01	4.25	3.41**
Total cooking losses (per cent)	12.91	16.53	2.68*
Total judges' scores	67.98	58.18	12.10**
Flavor-aroma scores	33.95	29.61	13.07**

* Significant difference.
** Highly significant difference.

more tender than that from cows, for only 18 pounds of shear force were required for steers while 28 pounds were required for cows. The number of muscle fibers per bundle is much greater in steer muscle than in cow muscle, 210 per bundle as compared to 165. The diameter or size of fibers is smaller in steers than in cows, 54 and 65 microns, respectively. This bears out further the finding (7) that meat containing large bundles of small fibers is more tender.

Muscle from cows contained more ether-extractable material but less total moisture than that from steers. That the cows were fatter was evidenced by the external appearance of the meat.

Total scores of judges were much higher for the steers than for the cows, averaging 68 and 58, respectively. Flavor-aroma of roasts from cows was graded much lower than roasts from steers.

Roasts from cows lost more weight in cooking than those from steers, 16.5 per cent being lost in the case of cows and only 12.9 per cent for steers.

Comparison of two grades.—Press fluid was the same for the two grades of heifer, medium and good, both in the adductor (round) and in the longissimus dorsi (11-12th ribs) muscles (Table 4).

Total moisture and ether-extractable material did not differ between the two grades of adductor muscle. However, in the longissimus dorsi muscle, total moisture was found higher in the medium than in the good grade, 72.21 per cent and 70.08 per cent, respectively, and ether-extractable material showed a tendency to be lower in the medium grade, although the value for P was just above the 5 per cent level.

Total cooking losses did not differ between the two grades of adductor or longissimus dorsi muscle.

Shear force was the same for the two grades, medium and good, of cooked adductor and longissimus dorsi muscles (Table 6). Since it was found in previous work (7) that the longissimus dorsi muscle was homogenous in respect to shear force, the raw 10th rib was tested and compared with the cooked 11-12th ribs. No significant difference was found between the raw and cooked longissimus dorsi muscles of either grade. A comparison of the tenderness of the raw cuts was made, and no difference was found between the two grades for either the adductor or the longissimus dorsi muscles.

No difference in palatability of the two grades of meat was found for either cooked muscle, as total scores of judges show (Table 6). It is interesting to find that the scores for the raw roasts (Table 5) were higher in both muscles for the good grade than for the medium, while in the cooked roasts no differences between the two grades were noted. Thus, although there was a difference between the two grades of raw meat, this difference was removed by cooking since neither palatability scores nor scores for external appearance differed for the two grades after cooking.

Table 4. Percentage Press Fluid, Total Moisture, Ether Extract, Total Cooking Losses of Roasts from Medium and Good Heifer Grades of Longissimus Dorsi and Adductor Muscles Cooked to 58° C. at 150° C.

Series No.	Press fluid				Total moisture				Ether extract				Total cooking losses			
	Longissimus dorsi		Adductor		Longissimus dorsi		Adductor		Longissimus dorsi		Adductor		Longissimus dorsi		Adductor	
	Medium	Good	Medium	Good	Medium	Good	Medium	Good	Medium	Good	Medium	Good	Medium	Good	Medium	Good
	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.
1.	53.65	55.35	52.11	54.59	.....	.....	.....	.....	.....	.....	.....	.....	7.88	7.86	16.62	12.06
2.	50.94	48.25	51.96	52.63	.....	.....	.....	.....	.....	.....	.....	.....	11.13	8.93	16.11	15.75
3.	43.30	54.97	51.83	53.46	75.32	68.71	69.62	71.76	1.85	5.31	4.75	2.30	8.14	6.15	15.77	17.09
4.	52.69	51.06	59.16	57.50	70.41	69.71	73.16	71.89	3.57	4.13	3.40	1.91	8.83	8.87	18.76	15.65
5.	54.93	54.05	52.83	56.29	71.45	72.53	71.31	69.71	6.24	1.49	2.03	5.77	8.77	7.29	14.31	13.51
6.	52.79	56.33	52.75	53.49	74.11	70.77	71.92	72.15	2.17	3.93	2.05	2.18	5.60	10.31	16.18	15.31
7.	57.75	48.53	53.03	56.55	73.81	71.67	71.84	72.33	1.34	2.20	1.66	3.83	9.43	8.76	17.25	17.45
8.	51.09	53.19	57.93	51.67	71.63	70.97	73.51	71.59	3.67	3.19	2.74	2.05	8.63	9.57	13.35	15.07
9.	54.05	55.79	57.02	55.05	75.15	70.87	73.38	71.94	3.04	3.29	3.54	1.95	9.62	9.18	10.88	13.61
10.	50.49	55.35	52.83	54.85	70.97	68.65	71.78	73.19	2.05	6.41	1.53	2.33	7.12	9.26	19.19	15.91
11.	51.35	52.58	54.47	57.10	71.55	68.51	73.79	71.13	2.31	5.29	1.95	4.25	8.69	9.17	14.19	12.52
12.	51.65	51.50	54.64	56.32	72.27	71.19	73.09	71.93	4.22	4.09	1.45	5.65	11.58	9.60	16.36	14.51
13.	50.15	53.95	58.61	55.55	69.57	68.72	71.33	71.84	4.19	7.67	4.71	1.70	8.80	13.02	14.29	16.57
14.	56.14	54.90	58.81	55.63	71.80	70.16	74.19	72.53	3.38	5.73	2.59	1.49	9.17	7.72	14.11	14.79
15.	49.05	51.39	52.38	51.87	70.65	68.64	71.41	69.34	2.85	5.37	1.95	3.31	10.17	8.46	15.90	15.97
Mean	52.00	53.15	54.69	54.84	72.21	70.08	72.33	71.64	3.14	4.47	2.64	2.98	8.90	8.94	15.55	15.05
t		0.99		0.20		3.97**		1.69		2.00		0.52		0.07		0.91

** Highly significant difference.

Table 5. Scores for External Appearance of Raw and Cooked Roasts from Medium and Good Heifer Grades of Longissimus Dorsi and Adductor Muscles Cooked to 58° C. at 150° C.

Series No.	Raw				Cooked			
	Longissimus dorsi		Adductor		Longissimus dorsi		Adductor	
	Medium	Good	Medium	Good	Medium	Good	Medium	Good
1.	26	32	20	27	16	14	19	16
2.	26	28	25	25	13	11	12	14
3	20	35	18	27	12	9	12	17
4.	25	28	22	27	13	13	16	16
5	22	25	21	25	10	14	14	11
6	19	24	21	20	10	13	16	17
7.	18	24	14	17	15	15	13	13
8.	24	33	15	23	14	14	14	17
9.	24	24	22	15	11	15	10	16
10.	22	30	20	17	15	14	14	12
11.	19	36	17	21	18	12	14	18
12.	16	25	19	28	14	15	.....	.....
13.	29	31	19	20	14	17	12	17
14.	19	26	13	26	13	15	13	16
15.	24	22	22	18	11	9	13	13
Mean	22	28	19	22	13	13	14	15
t		4.48**		2.23*		0.09		1.88

* Significant difference.
** Highly significant difference.

Table 6. Pounds Shear Force and Total Palatability Scores of Cooked Roasts from Medium and Good Heifer Grades of Longissimus Dorsi and Adductor Muscles Cooked to 58° C. at 150° C.

Series No.	Shear force				Total palatability scores			
	Medium	Good	Medium	Good	Medium	Good	Medium	Good
	Longissimus dorsi		Adductor		Longissimus dorsi		Adductor	
	pounds	pounds	pounds	pounds				
1.	21.67	24.33	26.62	23.59	71.25	64.75	62.50	62.75
2.	20.50	23.59	17.67	27.09	66.25	65.75	57.75	57.00
3.	19.33	20.55	19.41	17.79	67.34	66.33	60.99	59.33
4.	16.67	17.29	17.05	28.37	69.42	64.50	64.25	65.25
5.	27.83	21.95	25.00	23.79	60.00	59.17	60.75	64.00
6.	9.91	17.83	26.21	17.09	68.50	66.50	64.00	59.75
7.	15.56	15.42	33.00	29.91	63.50	67.00	57.00	58.75
8.	20.17	22.29	23.54	23.63	60.17	64.00	54.25	58.00
9.	21.75	19.17	21.17	21.58	59.00	66.00	59.59	57.00
10.	19.17	16.63	22.96	19.58	59.25	70.50	62.25	59.75
11.	18.71	21.17	25.09	26.50	65.50	63.75	58.00	60.50
12.	23.96	19.33	19.58	26.50	60.75	65.25	60.00	63.25
13.	16.75	14.91	22.54	22.83	66.00	72.25	63.25	62.00
14.	15.21	15.71	23.50	17.50	68.75	67.00	56.50	63.75
15.	19.41	20.42	24.05	17.00	61.25	62.50	60.75	55.75
Mean	19.11	19.37	23.16	22.85	64.46	65.68	60.12	60.45
t		0.30		0.21		0.99		0.39

SUMMARY

Effect of Cut

A comparison of the adductor, longissimus dorsi, and triceps brachii muscles of beef cooked to 58° at 150° C. gives these conclusions:

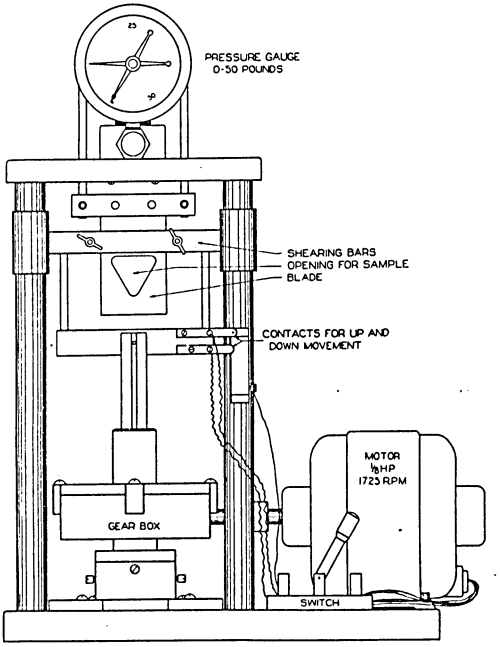

FIG. 3. CROSS SECTION OF THE MINNESOTA MODIFICATION OF THE WARNER-BRATZLER SHEAR-FORCE APPARATUS

1. The adductor, longissimus dorsi, and triceps brachii muscles do not differ in press fluid.

2. No differences were found between the triceps brachii and longissimus dorsi muscles in shear force, diameter of muscle fibers and number per bundle, or in total judges' scores, but the adductor muscle required more pounds of shear force, contained smaller bundles of larger muscle fibers, and ranked lower in palatability than the other two muscles.

3. Ether - extractable material increases and cooking losses decrease as ones goes from adductor to triceps brachii to longissimus dorsi muscle.

4. Total moisture was found significantly higher in the triceps brachii than in the longissimus dorsi muscle.

Effect of Class

A comparison of cows graded "good" and steers graded "high-medium to good" when each animal was represented by an average of the adductor, triceps brachii, and longissimus dorsi muscles cooked to 58° at 150° C. gave these conclusions:

1. Press fluid did not differ between the two classes.
2. Shear force was lower, muscle-fiber diameter smaller, and number of fibers per bundle larger for steers than for cows.
3. Palatability of meat from steers was judged much higher than that from cows. A great difference in flavor-aroma was found.
4. Ether-extractable material was higher and total moisture lower in cows than in steers.
5. Total cooking losses were greater in cows than in steers.

Effect of Grade

The comparison of medium and good grades of heifer when each animal was represented both by the adductor and the longissimus dorsi muscles cooked to 58° C. at 150° C. gave these conclusions:

1. No differences between the two grades, either in the adductor or longissimus dorsi muscles, were found in press fluid, shear force of cooked meat, shear force of raw meat, total cooking losses, total judges' scores, or scores for the appearance of the cooked roasts.

2. The longissimus dorsi muscle of the medium grade contained more total moisture and showed a tendency to contain less ether-extractable material than that from the good grade, but no difference in composition was found in case of the adductor muscle.

3. Both muscles in the raw state were scored lower for the medium grade than for the good grade.

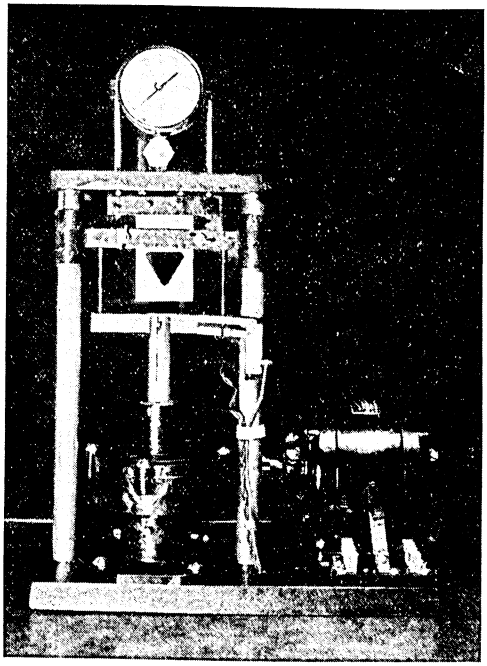

FIG. 4. THE MINNESOTA MODIFICATION OF THE WARNER-BRATZLER SHEAR-FORCE APPARATUS

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Score Card for External Appearance of Beef Roasts

Roast No. _____ Description of Cut _____

Factor	5	4	3	2	1
Shape	Very plump	Plump	Slightly shrunken or distorted	Shrunken	Very much shrunken
Color of lean	Rich golden brown	Light golden brown	Reddish brown	Slightly pale	Very pale or very dark
Color of fat	Rich brown	Light brown	Dull brown	Slightly pale	Very pale
Color of drippings	Rich brown	Light yellow or dark brown	Pale brown or slightly burnt	Dull brown	Very dull or pale

Score Card for Raw Beef

Factor	5	4	3	2	1
Color of lean	Bright cherry red	Dark or light cherry red	Dull red	Dark red	Very dull, dark red
Clearness of fat	Very clear	Few red streaks	Slightly streaked	Moderately streaked	Very streaked
Color of fat	White	Light creamy white	Gray white	Light yellow	Dark yellow
Firmness of lean	Very firm	Firm	Moderately firm	Soft	Very soft
Firmness of fat	Very firm and brittle	Firm and brittle	Moderately firm	Soft	Very soft
Marbling	Very abundant and extensive	Abundant and extensive	Moderate, limited distribution	Traces	None visible
Odor of meat	Very desirable	Moderately desirable	Slightly desirable	Slightly undesirable	Undesirable
Texture	Very fine	Fine	Slightly coarse	Coarse	Very coarse

Roast No.	Description of cut	Fat layer, cm. (over eye muscle)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

MEAT COOKING RECORD
Grading Chart for Cooked Meat

Laboratory No. _____ Date _____

Factor	Phase							
Aroma	Intensity	Very pronounced	Pronounced	Moderately pronounced	Slightly pronounced	Perceptible	Slightly perceptible	Imperceptible
	Desirability	Very desirable	Desirable	Moderately desirable	Slightly desirable	Neutral	Slightly undesirable	Undesirable
Texture	Intensity	Very fine	Fine	Moderately fine	Slightly coarse	Coarse	Very coarse	Extremely coarse
Flavor of fat	Intensity	Very pronounced	Pronounced	Moderately desirable	Slightly desirable	Neutral	Slightly undesirable	Undesirable
	Desirability	Very desirable	Desirable	Moderately desirable	Slightly desirable	Neutral	Slightly undesirable	Undesirable
Flavor of lean	Intensity	Very pronounced	Pronounced	Moderately pronounced	Slightly pronounced	Perceptible	Slightly perceptible	Imperceptible
	Desirability	Very desirable	Desirable	Moderately desirable	Slightly desirable	Neutral	Slightly undesirable	Undesirable
Tenderness	Intensity	Very tender	Tender	Moderately tender	Slightly tough	Tough	Very tough	Extremely tough
Quality of juice	Intensity	Very rich	Rich	Moderately rich	Slightly rich	Perceptible	Slightly perceptible	Imperceptible
	Desirability	Very desirable	Desirable	Moderately desirable	Slightly desirable	Neutral	Slightly undesirable	Undesirable
Quantity of juice	Intensity	Very large	Large	Moderately large	Slightly large	Small	Very small	Negligible
	Desirability	Very desirable	Desirable	Moderately desirable	Slightly desirable	Neutral	Slightly undesirable	Undesirable

Place the number of the meat sample above the word which best describes your opinion of the quality.