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WAY OF CUTTING BEEF SAMPLES AND ITS EFFECT ON LOSSES

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SUMMARY

A total of 135 samples from the Semitendinosus muscle of 15 steers were utilized in this study to verify the way of cutting the samples: across or along the fibers and by changing the size of the samples, on losses. Samples were frozen for 1 week, thawed and cooked in a water bath at 70C. Samples cut across fibers presented an average drip loss of 5.5%, cooking loss of 32% and total loss of 36%. Samples of same weight but cut along the fibers presented 3, 28 and 31% drip, cooking and total loss, respectively. It can be concluded that in order to reduce losses in moisture, it is of paramount importance to minimize the area cut across fibers.

INTRODUCTION

One important problem related to the merchandizing of meat is the phenomenon of drip which is the red, viscous fluid that exudates from the surface of a muscle once it has been cut. Although it occurrs both in chilled and frozen meat, the problem is of great magnitude in the latter; bringing about economic losses due to the loss in weight of the muscle and constituting a serious aesthetic disadvantage for the consumer. An intact muscle presents little proportion of drip, but once it has been subdivided into smaller cuts, the total amount of fluid obtained is increased and it is largely determined by the area of cut muscle surface, Callow (1952) and Howard (1956). Locker and Daines also sugested that intact surfaces are not significant sites for moisture loss, but only cut surfaces. In the same work it was also found that cooking losses declined markedly vith increasing the length along the muscle fibers. Penny (1974) stated that one of the most important factors influencing the amount of fluid that exudates from a piece of meat, is the ratio of cut surface to weight or volume based on the assumption that by increasing the ratio, the water has less distance to travel to the cut surface. Similar findings were reported by Ramsbotton and Koons (1939) and Howard (1956) who reported that pieces with the same cross section but varying in thickness from 1 to 3 cm, presented a drip loss of 8 and 6% respectively. Howard and Lawrie (1956) suggested that the amount of moisture lost from bulk samples is determined both by the surface area of the exposed surfaces and by a physical characteristic of the meat which determines the rate of movement of fluid to the surface.

The present investigation was undertaked aiming to quantify the amount of losses by varying the way the samples were cut: across or along the fibers and also by changing the weight of the muscle samples.

MATERIAL AND METHODS

Eight Semitendinosus muscles were removed 48 hs after slaughter from steers varying in age from 18 to 24 months old. The samples obtained from the muscles were cut following the main objective: samples cut across or along the fibers and with different dimensions and weights. The dimensions and weight of the samples were as follow:

Across fibers		Along fibers	
Dimensions cm	Weight g	Dimensions	Weight
2x2x2=222	8	2x2x2=222	8
2x4x2=242	16	2x2x4=224	16
2x6x2=262	24	2x2x6=226	24
2x8x2=282	32	2x2x8=228	32
2x10x2=2102	40	2x2x10=2210	40

The first digit corresponds to the thickness of the sample. The second to the dimension across fibers and the third one, to the dimension along fibers. In the overall, 135 samples were utilized in this study. After being obtained, the samples were weighed, wrapped in polyethylene and frozen at a temperature of -20 C for 1 week. Samples were thawed overnight (about 18 hs) at a temperature of 7 C. They were then removed from the plastic film, dried with tissue paper and weighed to determine drip loss. They were then cooked unprotected in a water bath for 30 minutes to an internal temperature of

70C. After that period they were dried and weighed to determine cooking losses.

RESULTS AND DISCUSSION

The effect of the different way of cutting the samples on drip, cooking and total losses is presented in Table 1.

Table 1. Effect of way of cutting beef samples on losses.

	Across fibers					Along fibers				
DRIP LOSS										
Dimension	222	242	262	282	2102	222	224	226	228	2210
Loss wt g	.41^{a}	.87^{b}	1.24^{c}	2.25^{d}	2.72^{e}	.31^{a}	.50^{a}	.94^{ba}	1.19^{bc}	1.02^{bc}
SD	.18	.39	.47	.72	.43	.18	.17	.21	.19	.09
Loss %	4.71^{bcd}	5.06^{cd}	4.73^{bcd}	6.46^{e}	6.43^{e}	2.89^{a}	2.93^{a}	3.13^{ab}	3.65^{abc}	2.60^{a}
SD	.70	.67	.51	1.03	1.01	.36	.23	.41	.62	.43
COOKING LOSS										
Loss wt g	2.78^{b}	5.48^{d}	8.14^{f}	10.66^{g}	12.25^{h}	2.68^{a}	4.82^{c}	6.84^{e}	8.66^{f}	10.44^{g}
SD	.15	.71	.34	1.00	.93	.14	.37	.63	.94	1.07
Loss %	33.26^{c}	32.12^{c}	32.77^{c}	32.46^{c}	30.98^{bc}	31.43^{bc}	28.92^{ab}	27.96^{a}	27.55^{a}	26.33^{a}
SD	2.35	1.28	1.58	1.83	1.20	1.94	1.60	2.22	2.83	2.76
TOTAL LOSS										
Loss wt g	3.19^{a}	6.35^{c}	9.37^{e}	12.89^{g}	14.97^{h}	2.99^{a}	5.32^{b}	7.95^{d}	9.86^{e}	11.47^{f}
SD	.23	.41	.36	.68	.96	.24	.36	.89	1.04	1.09
Loss %	36.37^{cd}	35.56^{cd}	36.12^{cd}	36.83^{d}	35.43^{cd}	33.83^{c}	31.00^{b}	30.80^{b}	30.10^{ab}	27.97^{a}
SD	2.35	1.85	1.48	.48	1.00	2.34	2.05	1.85	2.32	2.43

^{abcdefgh} Means bearing at least one common superscript in the same line are not significantly different (P .05)

Samples cut across fibers presented a significantly higher drip loss both by weight and percentage in relation to the ones of the same weight but cut along the fibers. The average loss in weight was 1.50 and .79g for samples cut across or along the fibers respectively. When the loss was expressed in % the following average values were obtained: 5.5 and 3.0%. Increasing the area cut across fibers therefore, increased the amount of drip. As the sample size increased, there was a concomitant increase in the weight of drip in both treatments with a tendency however to decrease the amount of drip as the size of the sample became larger; which gives an indication that the line would tend to level off with larger samples. Drip loss by percentage however when compared within treatment (across or along fibers) were not significantly affected by the size of the samples, with the exception of the larger two samples cut across fibers (282 and 2102) which presented higher losses. These results agree with the conclusions of Ramsbotton and Koons (1939), Howard (1956) and Penny (1974)..

Samples cut across fibers also presented higher cooking losses both by weight and % than the ones abtained along fibers. As the sample size increased there was also an increase in cooking losses by weight in both treatments. However, percentage-wise although there was a tendency for the larger samples to loose less water, the differences when compared within treatments were not significantly different. The same kind of results were obtained for total (drip + cooking) whith samples cut along fibers presenting significantly lower losses than their counterparts.

Simple correlation coefficients between way of cutting and size of sample in relation to losses are presented in table 2.

Table 2. Simple correlation coefficients between dimensions, size of sample and losses.

	Length along fiber	Area cut across	Area uncut	Sample weight
Drip g	.27*	.64**	.61**	.90**
Drip %	-.17	.30**	.05	.20*
Cooking g	.36**	.70**	.66**	.99**
Cooking %	-.55**	.03	-.61**	-.49**
Total g	.35**	.70**	.67**	.99**
Total %	-.54**	.15	-.50**	-.33**

* p .05
** p .01

Table 3 presents some regression equations to estimate the losses.

Table 3. Regression equations to estimate losses.

	Equations	R^2
Drip g	y = -.14 + .056 (sample wt. g)	80.1%
Drip %	y = 4.21 + 028 (area cut cm2)	8.4%
Cooking g	y = .69 + 25 (sample wt. g)	97.8%
Cooking %	y = 32.06 - .053 (area uncut cm2)	36.5%
Total g	y = .56 + 31 (sample wt. g)	97.8%
Total %	y = 34.79 - .40 (fiber length cm)	29.1%

The weight of the sample presentend the highest coefficents with losses by weight followed by area cut across fibers and area uncut. In relation to percentage of drip, the highest coefficient (.30) was found for the area cut. Area uncut and length along fibers, that are inversely proportional to the area cut, were more higly correlated with percentage of cooking and total losses respectively.

It can be seen that weight of the sample was the most powerful variable influencing the losses by weight. What concerns % of drip, the area cut was the most important variable, although the variation in drip accounted for this variable was less than 10%. The area uncut and the length along the fiber were the variables that mostly influenced % of cooking and total losses.

CONCLUSIONS

The results of the present study in general terms agree with previous findings that increasing the surface of the area cut promotes an increase in the losses, with samples cut along fibers presenting lower losses than their counterparts (across fibers).

The losses when expressed by weight were mostly affected by the weight of muscle sample.

The magnitude of area cut was the most important single variable affecting percentage of drip. Percentage of cooking and of total loss were more influenced by area uncut and length along the fibers.

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