# THE EFFECT OF CARCASS MUSCLING ON YIELD OF EDIBLE PORTION OF CULL COW CARCASSES

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## INTRODUCTION

Carcass physical composition is a very important issue due to its implication on the economy of the meat trade as a whole. Although cow meat is not normally sold as fresh cuts in the retail showcases in the US, this source of meat once transformed in ground beef, represents a very high proportion of total beef consumed in the Country.Therefore if one can with reazonable accuracy evaluate the amount of muscle that is present in a carcass, this would permit the selection of carcasses that will produce a larger amount of edible portion and a better ratio of edible portion to bone. The use of subjective evaluation of conformation, that includes the external fat, seems to be an unreliable method to attain this objective. Pierce (1957) reported a study involving 459 carcasses ranging in grade from Prime through Canner and concluded that finish influenced the yields of most wholesale cuts considerably more than conformation. Tyler et al. (1964) however obtained somewhat different results when compared carcasses of high Choice and low Good conformation. The better conformation group had larger ribeyes, thicker outside fat and less bone. At the same thickeness of fat, thichly muscled, higher conformation cattle had higher cutability than thinly muscled cattle. In a study conducted by Kauffman et al. (1970), the composition of 12 steers carcasses possessing Prime average conformation (mesomorphs) was compared to another 12 steer carcasses with Standard plus conformation (ectomorphs). The first group was 25 Kg heavier at slaughter and measured 9 mm fat thickness in comparison to 6mm for the ectomorph group. They concluded that mesomorphs showed a higher cutability, 2.3 yield grade than ectomorphs, 3.0 yield grade, mainly due to a larger ribeye area. Also the better conformation group of steers contained significantly more fat free muscle and less bone and thus a higher muscle to bone

ratio. The main objective of the present study was to evaluate the effect of muscling on the yield of edible portion of cow carcasses.

## MATERIALS AND METHODS

The carcasses used in this study were selected from cows over 4-years of age of British, Zebu and Dairy breeding type that were slaughtered, chilled and bone out at the Lykes Packing Co.Plant at Plant City, Florida, USA. A total of 125 cow carcasses were used. Muscling score was determined by visual appraisal by a committee of three experienced persons using the following scale: Choice plus=18, Choice minus=16, Good plus=15, Good minus=13, Standard plus=12 and Standard minus=10. Muscling evaluation was determined in the round (including the rump and sirloin) and in the overall carcass, trying to exclude the external fat from the evaluation. Ribeye area was determined in the Longissimus muscle, between the 12th and 13 th rib. Fat thickness from a point 3/4 the distance from the dorsal to lateral portion of the Longissimus. Carcass length (CL) was measured from the anterior edge of the aitch bone to the mid-point of the junction between 7 th cervical and 1st thoracic vertebra. Round length (RL) from the junction of tibia and first tarsal bone to the anterior edge of the aitch bone. Shoulder thickness (ST)was measured on the cranial edge and mid length of the first rib, on a plane perpendicular to the long axis of the carcass.

Trimmable fat was that exceeding 1.27 cm depth that was trimmed off. Edible portion in this study includes all lean and fat obtained from carcass after trimmable fat; kidney, heart, pelvic fat and bone had been removed.

## RESULTS AND DISCUSSION

The data showed in the following tables represent average values independently of breeding type.

A wide variation was found in all measurements as expected due to selection procedures. The mean overall muscling score was high Standard which agrees with the results of Müller and Grassi (1986) working with Charolais cows. Price and Berg observed a fat thickness (FT) of 1.5cm, ribeye area (REA) of 71,2 cm2 for a carcass weight of 295 kg from cow carcasses of mixed breeding. The average values for CL and RL closely

TABLE 1. GENERAL CHARACTERISTICS OF CULL COW CARCASSES

| | | Mean | St.Deviation | Range |
|---|---|---|---|---|
| Hot carcass weight | kg | 266,24 | 55,09 | 150 - 400 |
| Round muscling [a] | | 12,97 | 2,28 | 6 - 17 |
| Overall muscling [a] | | 12,47 | 2,19 | 6 - 17 |
| Fat thickness | cm | 1,01 | .73 | 0 - 4 |
| Carcass length | cm | 137.31 | 8,99 | 119 - 162 |
| Round length | cm | 65,60 | 5.46 | 54 - 81 |
| Shoulder thickness | cm | 16.69 | 2.11 | 7 - 20 |
| Ribeye area | $cm^2$ | 64.26 | 11.80 | 39 - 97 |

a

12 = Standard plus 13 = Good minus

agrees with the results of Müller et al. (1984) that reported CL of 135.07 and RL of 66.30 for Devon cow carcasses. In their work however FT was lower (.60cm) and REA (55.84cm2) Table 2 displays the data concerning edible portion and bone in the carcass.

The majority of the carcasses required little trimming but in a few carcasses extensive trimming was necessary. Weight of bone varied considerably due to the extreme variation in skeletal frame of the carcasses used. Some of the Angus cow carcasses were very small, whereas the Holstein carcasses had very large frames. Bone percentage averaged 18.19% as expected, as a result of the inferior muscle development and thinner subcutaneous fat cover.

The least square means for edible portion according to muscling groups can be seen in Table 3.

Cows with Choice muscling were significantly heavier than Standard or Utility carcasses but were similar in weight to Good muscling carcasses. No significant difference was observed among the three muscling groups. Choice and Good muscling groups had significantly more kg of edible portion (EP) even though having significantly more fat cover than Standard and Utility groups. EP expressed as percent of HCW was highest in the Choice group and lowest in the Utility muscling group. EP% in Good, Standard and Utility groups did not differ

TABLE 2. GENERAL PHYSICAL COMPOSITION OF CULL COW CARCASSES[a]

| | | | Mean | St.Deviation | Range |
|---|---|---|---|---|---|
| Hot carcass weight[b] | HCW | kg | 266,24 | 55,09 | 150 - 400 |
| Edible portion | EP | kg | 97,35 | 20,14 | 54 - 145 |
| Fat trim | | kg | 3,56 | 3.42 | .23 - 22 |
| Bone | B | kg | 24.31 | 5.50 | 16 - 41 |
| Proportion of HCW | | | | | |
| Edible portion | | % | 73,27 | 2.90 | 52 - 79 |
| Fat trim | | % | 2.56 | 2.20 | .17 - 13 |
| Bone | | % | 18.19 | 2.21 | 14 - 23 |
| Edible portion/Bone | | | 4.09 | .52 | 3 - 6 |

[a] Wheight of EP, fat trim and bone combined do not equal weight of HCW due to cooler shrink and small cutting losses

[b] Refers to the whole carcass weight but only the right side was used

TABLE 3. LEAST SQUARE MEANS FOR PHYSICAL COMPOSITION ACCORDING TO MUSCLING GROUPS OF COWS

| | | MUSCLING GROUP | | | |
|---|---|---|---|---|---|
| | | Choice-8 | Good-63 | Standard-42 | Utility-12 |
| Hot carcass weight | kg | 152.75 a | 138.04 ab | 124.54 b | 122.49 b |
| Edible portion | kg | 114.38 a | 101.27 a | 90.92 b | 87.95 b |
| Bone | kg | 24.01 | 24.22 | 23.97 | 23.64 |
| Fat thickness | cm | 1.47 a | 1.19 a | .81 b | . 53 b |
| Proportion of HCW | | | | | |
| Edible portion | % | 74.99 a | 73.47 ab | 73.06 ab | 71.99 b |
| Fat trim | % | 3.94 a | 3.11 a | 1.89 b | 1.11 b |
| Bone | % | 15.64 a | 17.55 b | 19.25 c | 19.47 c |
| Edible portion/Bone | | 4.82 a | 4.22 b | 3.84 c | 3.75 c |

[abc] Means bearing the same superscripts are not significantly [d] ($P$ .05)

[d] Refers to the right side of carcasses

significantly although mean values indicate a decline as the score for muscle development decreased. No statistical difference was found in bone weight among the four muscling groups, but due to the difference in carcass weight, muscling and finish, the Choice and Good groups had significantly lower percentages of bone and a wider ratio of EP/B than the Standard or Utility groups. These results agree with the findings of Kropf and Graf (1959), who reported muscle to bone ratios of 3.87, 4.10 and 4.37 for Commercial, Good and Choice conformation, respectively. Wooten et al.(1979) working with Hereford cows reported a bone % of 18.5 whereas Phoya and Butler-Hog (1984) in a study with Friesan cows found a muscle/bone variation from 3.5 to 4.1 according to days on feeding.

Simple correlation coefficients among edible portion and some carcass parameters are presented in table 4.

Weight of EP was significantly correlated with all measurements. Proportion of EP was significantly associated with the expressions of muscling: round, overall muscling and ribeye area but not with shoulder thickness. EP/B presented a high correlation with all measurements but HCW. A high negative correlation was obtained with CL (-.34) and RL (-.49). It can be concluded from the results of the present work, that subjective evaluation of muscling in cow carcasses can be used successfully to predict the yield of edible portion and the ratio of edible portion/bone.

TABLE 4. SIMPLE CORRELATION COEFFICIENTS BETWEEN YIELD OF EDIBLE PORTION AND SOME CARCASS MEASUREMENTS IN COWS

| | EPWt | EP% | EP/B |
|---|---|---|---|
| Hot carcass weight | .98** | -.08 | .15 |
| Round muscling[a] | .42** | .25** | .48** |
| Overall muscling | .37** | .24** | .54** |
| Ribeye area | .71** | .19* | .23** |
| Shoulder thickness | .69** | .09 | .53** |
| Carcass lenght | .76** | -.09 | -.34** |
| Round lenght | .59** | -.07 | -.49** |
| Fat thickness | .22* | -.09 | .61** |

[a] The round includes de rump and the sirloin.

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