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Fat Thickness as an Alternative to Marbling in Beef Carcass Grading

M. E. Dikeman and K. E. Kemp

Summary

Data from 1669 steers show that equally palatable beef comes from carcasses with Choice marbling OR 0.4 inch of outside fat cover. Including cattle with 0.4 inch of fat and at least Slight marbling in a new Choice grade would cut 20 to 30 days from the feeding period.

Introduction

Marbling accounts for about 10% of the variation in cooked beef palatability, but marbling tells more about the nutritional background of cattle than about palatability of beef. Fat thickness also indicates nutritional background and predicts cooked beef palatability as well as marbling. It also affects the rate a carcass chills, which should determine whether or not cold toughening will occur.

We studied fat thickness as an alternative to marbling in a beef grading system, but not with the thought of eliminating marbling from grading. Instead, we wanted to evaluate fat thickness as an alternative to marbling for carcasses that have A maturity, and lean color, firmness and texture typical of Choice grade, but not enough marbling by present grade standards to qualify for Choice.

Experimental Procedure

We analyzed data from 1,669 steer carcasses from cattle from 12 sire breeds of different biological types mated to Hereford and Angus females. The 1,669 cattle were part of the Germ Plasm Evaluation project at the U.S. Meat Animal Research Center at Clay Center, Nebr. They ranged from 12 to 17 months old at slaughter, and had been fed, from weaning to slaughter, a moderately high energy ration primarily of high quality corn silage, corn grain, and supplement that averaged 72 to 76% total digestible nutrients (TDN). Cattle in each crossbred type each year were slaughtered in three equal groups: the first group when Hereford x Angus crosses averaged 950 lb.; the second and third groups, 35 and 70 days later. Carcasses were quality and yield-graded, and rib steaks were frozen for subsequent cooking and palatability evaluation. Steaks 1 1/8 in thick were cooked 350 F to an internal temperature of 151 F in a large gas oven. Cores 1/2 in. in diameter from one steak from each steer were sheared by the Warner-Bratzler shear, and cores from another steak from a subsample of 758 steers were evaluated by a trained taste panel for tenderness, flavor, and juiciness.

Results and Discussion

Table 6.1 presents marbling and palatability data for carcasses stratified into five fat thickness categories. As expected, their marbling scores differed significantly between fat thickness categories. Carcasses with less than 0.3 in. fat thickness were significantly less flavorful and less tender than carcasses with 0.3 in. or more fat. Warner-Bratzler shear force and flavor measurements did not differ among carcasses from 0.3 to more than 0.6 in. fat thickness. For taste panel tenderness, carcasses with a minimum of 0.5 in. fat thickness were rated more tender than those with 0.3 to 0.39 in., but no more tender than those with a minimum of 0.4 in. Palatability apparently does not improve as fat thickness increases beyond 0.4 in.

Figure 1 compares Warner-Bratzler shear and taste panel means for carcasses that qualified for Choice and Prime by present grade standards with those that had at least 0.4 in. of fat thickness. Carcasses that had at least 0.4 in. fat thickness were equal in palatability to those that graded low Choice or higher. Therefore, these data indicate that beef grade standards could be changed to allow carcasses to qualify for Choice by having EITHER 0.4 in. fat thickness OR Choice marbling. Two large studies by other universities have shown that 0.3 in. and Slight marbling gives equal palatability to the present choice grade. To prevent some grass-fed cattle from qualifying for Choice, the standards should specify "white" fat, and a minimum of Slight marbling. In this experimental group of 1,669 carcasses, 61.3% graded low Choice or higher by present grade standards. However, 77.5% had at least 0.4 in. of fat thickness OR low Choice or higher marbling. Thus, 16% more carcasses were recognized for their excellent palatability by using fat thickness as an alternative to marbling. Commercially fed cattle likely would show a similar percentage increase.

If the meat industry needs only the current percentage of Choice carcasses, feeders could cut 20 to 30 days of the feeding time under this system.

Table 6.1. Marbling and palatability data for carcasses in five fat thickness categories.

Fat thickness	Marbling ¹	A. B. shear, lb.	T. P. ² tend.	T. P. ² juice	T. P. ² flavor
.00 to .29 in	7.8 ^e	7.78 ^a	6.84 ^c	7.14	7.33 ^b
.30 to .39 in	10.1 ^d	7.32 ^{bc}	7.20 ^b	7.15	7.46 ^a
.40 to .49 in	10.8 ^c	7.39 ^b	7.29 ^{ab}	7.21	7.49 ^a
.50 to .59 in	11.7 ^{bc}	7.16 ^{bc}	7.38 ^a	7.20	7.46 ^a
≥ .60 in	12.9 ^a	7.08 ^c	7.41 ^a	7.29	7.54 ^a

a,b,c,d,e, Means in a column with different superscripts differ significantly (P<.05).

¹Score of 7 = slight⁻, 8 = slight⁰, 9 = slight⁺, 10 = small⁻, 11 = small⁰, 12 = small⁺, etc.

²Score of 1 = extremely tough, dry or bland flavor: 9 = extremely tender, juicy or intense flavor.

▨ = Choice and Prime carcasses.

□ = Carcasses with .40 in. or more fat thickness.

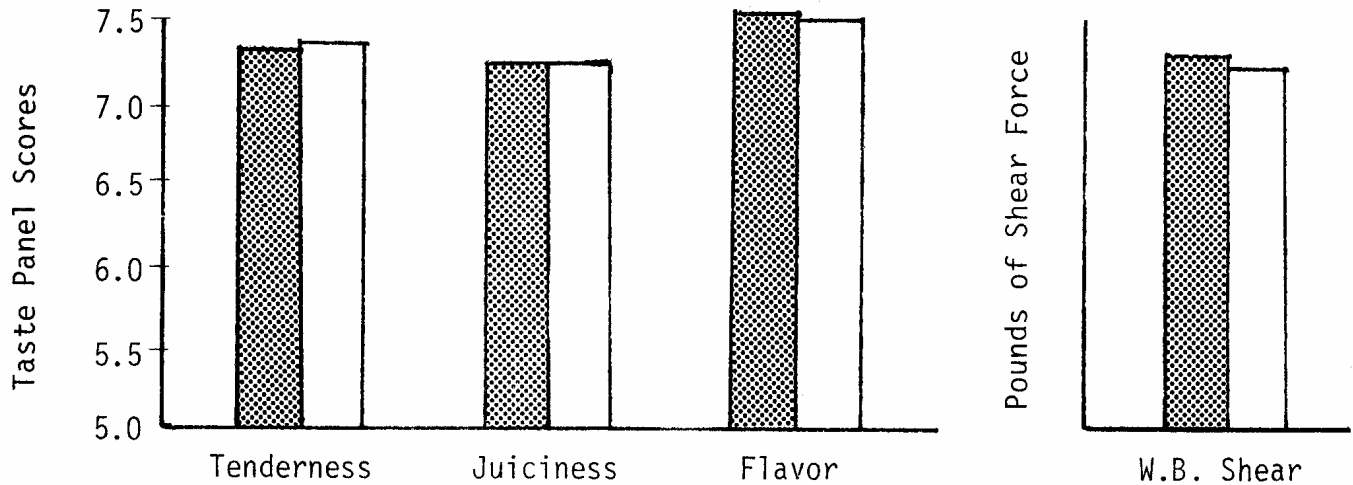


Figure 1. Taste panel scores and Warner-Bratzler shear value comparisons for carcasses grading Choice and Prime versus those with .40 in. or more fat thickness regardless of marbling score.

Is it Time for a New Beef Grade?

Economic pressure on cattle feeders and the consumer's apparent desire for leaner beef may mean it's time to change the way we grade beef. Average cost of gain is about 57¢ per pound for the entire feeding period. The early gains are economical. But since the cost of gain late in the feeding period is much higher, it costs too much to get cattle into the choice grade. If the beef is palatable before the cattle grade choice (and research shows it is,) then we may need a new grade that has enough quality to insure palatability, but has a minimum of outside fat. Choice-lean might be a good name. Grain feeding produces quality beef, but cutting 20 to 30 days off the feeding period through changing the grading standards should benefit the whole industry.