Laboratories, taste panels and palatability

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Session 5b

Meat tenderness or palatability can be estimated either objectively (in a laboratory using an instrument) or subjectively (sensory analysis e.g. a taste panel).

Objective measurements

Tenderness assessment by consumers is based on the complex and multifaceted actions that occur during biting and chewing. No instrument can mimic these, so measurements are obtained for a number of objective methods that closely correlate with one or other of these actions. The two most used measurements are *shear force*, which measures the force needed to shear through a slice of meat (i.e. biting), and *compression*, which measures the force needed to compress a piece of meat (i.e. chewing). Shear force estimates toughness caused by both the muscle fibres and connective tissue, and compression estimates the contribution of the connective tissue to meat tenderness. The higher the values (in kg) the tougher the meat. Values less than 4.5kg for shear force and 2kg for compression are usually "acceptable" for beef.

Juiciness is difficult to measure objectively. Instead, the water holding capacity of the raw meat is measured. This is defined as the ability of meat to retain its water after the application of some force such as pressure or centrifugation. Because the results of these techniques are difficult to relate to consumer-assessed juiciness, they are not routinely used.

Flavour and *aroma* cannot be measured objectively in any way that can be meaningfully related to a consumer's appreciation of these factors. However, research techniques are available to identify the chemical constituents that contribute to flavour differences.

Taste panels

Taste panels are used for sensory assessment of "palatability", which is a function of tenderness, juiciness and flavour/aroma. In the MSA testing procedure consumers assess tenderness, juiciness, flavour and "overall liking". They do this (separately for each trait) by marking their assessment with a vertical line on a continuous, unstructured 100mm line scale anchored at each end by the terms extremely tough and extremely tender (Figure 5b-1), extremely dry and extremely juicy, dislike extremely and like extremely. The position of this mark on the line is measured. Values range from 0 to 100, with 0 being equivalent to the left (unacceptable) end of the line. The values obtained for each of the individual traits are combined into an overall palatability score using weightings derived from a discriminant analysis. For the MSA MQ4 score the weightings are 0.4 (tenderness), 0.2 (juiciness), 0.1 (flavour) and 0.3 (overall liking). The higher the combined score, the more palatable the meat. The lower threshold for MSA 3 star is a score of 48.

Figure 5b-1. Consumers make their assessment of tenderness by placing a vertical mark on a 100mm line like this one.

To ensure a fair comparison between different samples tested over time all samples are prepared and cooked in a standard manner (i.e. thickness, temperature, cooking time) for each cooking method. To get a good estimate of the palatability of a piece of meat, it needs to be assessed by 10 people. This allows for the normal variation between consumers in how they perceive a piece of meat, and for the fact that meat is not a homogeneous product, varying in (e.g.) tenderness from one part of a muscle to another.

Do objective measurements relate to taste panel scores?

Objective measurement of toughness can give a good idea of the likely tenderness of a piece of meat, although no one measurement is precise. This is evident by the wide scatter of points around the line of best fit in Figure 5b-2, which shows the relationship between taste panel

tenderness scores and A) shear force and B) compression in striploins which had undergone a variety of post-slaughter treatments to induce a wide range of tenderness. The line indicates that, in general, tenderness scores are lower at high shear force and compression values. The scatter of data points around the line shows that there is a large amount of variation in tenderness scores at any one shear force or compression value. Combining more than one measurement in an equation to estimate tenderness, with other known factors (e.g. whether or not stimulated or tenderstretched), improves the accuracy.

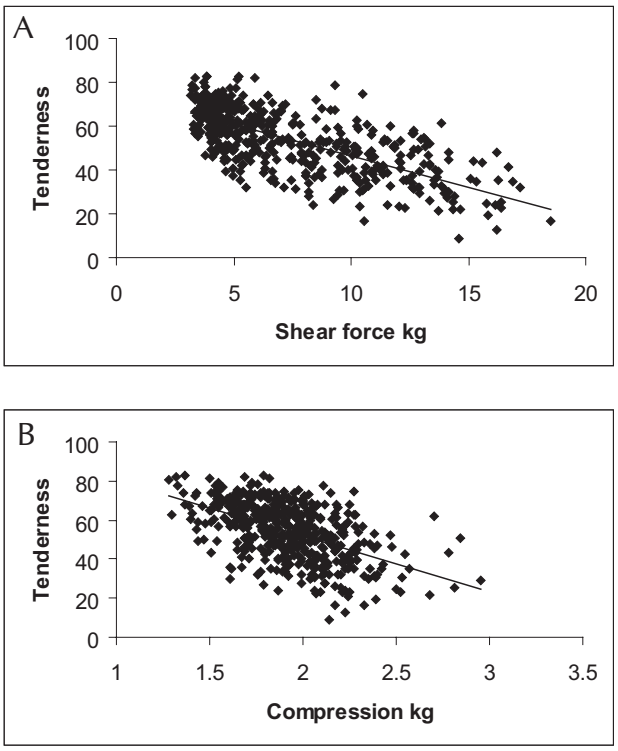

Figure 5b-2. Relationship between tenderness scores and A) shear force, B) compression in the striploin (Rymill, unpublished).