BEEF DARK CUTTERS DISCRIMINATION BY VISIBLE AND NEAR INFRARED SPECTROSCOPY

N. Prieto[1,2]*, Ó. López-Campos[2,3], R. T. Zijlstra[1], and J. L. Aalhus[2]

[1]Department of Agricultural, Food and Nutritional Science, University of Alberta, 4-10 Agriculture/Forestry Centre, Edmonton, Alberta, T6G 2P5, Canada.
[2]Lacombe Research Centre, Agriculture and Agri-Food Canada, 6000 C&E Trail, Lacombe, Alberta, T4L 1W1, Canada.
[3]Livestock Gentec, Edmonton, Alberta, T6G 2C8, Canada.

* nuria.prieto@agr.gc.ca

Dark cutters, often referred to as dark, firm and dry (DFD) meat, are presumed to belong to a group of cattle that have experienced prolonged stress prior to slaughter. In Canada, dark cutters (carcasses graded as B4) are distinguished at the time of grading by the excessively dark colour of the rib-eye using a visual colour chart developed by the Canadian Beef Grading Agency, and are heavily discounted. Hence, a reliable and operationally practical method that objectively assists in discriminating dark cutters from normal beef is needed. Near infrared spectroscopy (NIRS) is a sensitive, fast, and non-destructive technology, that with no sample preparation, provides information about the molecular bonds of organic compounds and tissue ultra-structure in a scanned sample. This study examined the potential of visible and near infrared reflectance spectroscopy (Vis-NIRS) to segregate dark cutters from normal beef. One hundred and twenty left beef carcass sides were selected from a commercial slaughter plant by experienced graders according to their carcass grade: 60 normal and 60 dark cutters. At approximately 48 h post mortem, a 2.5-cm thick steak (at ~7/8th thoracic vertebrae) was removed, vacuum packaged and frozen at -25 °C until spectra collection. After thawing overnight at 2 °C, Vis-NIR spectra were collected on intact steaks prior to oxygenation (non-bloomed samples) and following 20 min of exposure to atmospheric oxygen (bloomed samples), using a portable LabSpec®4 spectrometer (350-2500 nm) at the laboratory. Partial least squares discriminant analysis correctly classified 95% of the non-bloomed beef samples from both normal and dark cutter carcasses, and 88 and 93% of the bloomed samples from normal and dark cutter carcasses, respectively. Vis-NIRS technology can objectively assist in segregating dark cutters from normal beef. Further work remains to be carried out to develop robust Vis-NIRS models to be implemented on-line in the abattoir, where portable equipment applied directly on the carcass could objectively assist in dark-cutting carcass segregation.
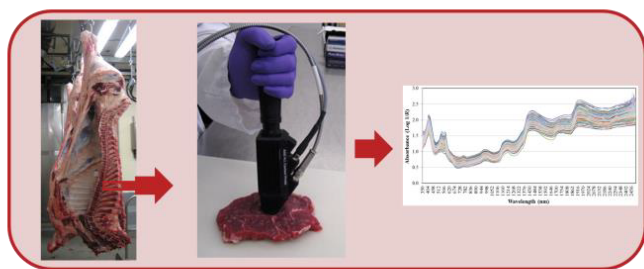
Figure 1. Collection of visible and near infrared spectra on intact beef samples using a portable LabSpec®4 spectrometer equipped with a fibre-optic high intensity contact probe.
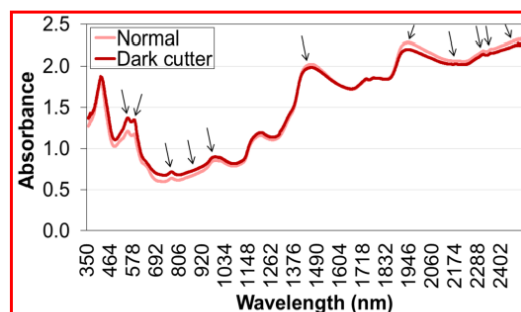

Figure 2. Average visible and near infrared spectra of normal (n = 60) and dark cutter (n = 60) carcasses (non-bloomed samples)