

SPECTRAL EVOLUTION

Analysis of Meat Tenderness

Meat, beef, and poultry processing in the United States is predicted to be a \$179 billion industry in 2012, and after five stagnant years, growth is expected for the next five, according to a report from IBISWorld. There are 6,278 federally inspected meat and poultry slaughtering and processing plants in the U.S. alone. Most processing however, is controlled by four companies: Tyson Foods, Cargill Meat Solutions, JBS USA, and National Beef Packing. Together they own 75% of the meat processing and packing market in the US.

Meat processing typically includes both slaughtering and packaging. Whether processing chicken, pork, or beef, meat processing plants are concerned with speed and quality. Color, texture, and sensory appeal are important characteristics for the industry. In addition, the desire of health-conscious consumers to know the nutritional data of foods, including meat, has led to the use of NIR spectroscopy as a tool for analyzing both raw and processed meat. Using VIS/NIR spectroscopy can allow meat processors and packagers to meet the latest demands of more health conscious consumers, market price pressures, and increasingly strict industry standards.

Traditional grading by marbling typically results in categorization as either Choice or Select. With better tenderness measurement, many Select graded steaks might actually be classified as "Tender Select" and could be sold at a higher price that was still attractive to the consumer. Using a spectrometer with a contact probe specifically designed for this application, could provide a fast and more accurate method for grading beef than traditional intra-muscular marbling.

Meat tenderness analysis could be accomplished with a SPECTRAL EVOLUTION SM-3500 with a three array detector configuration covering the entire spectrum of UV/VIS/NIR:

- ◆ 512 element Si array – 350-1000nm
- ◆ 256 InGaAs array – 970-1900nm
- ◆ 256 InGaAs array – 1900-2500nm

Using the SM-3500, a large number of beef carcasses could be analyzed, non-destructively, in a short amount of time. Once the spectra are captured using the SM-3500's DARWin Data Acquisition software, the data is saved in ASCII files for immediate use with no pre-processing required. The data can be analyzed with many different third party chemometrics software packages.

Other potential applications for NIR spectroscopy could be the evaluation of the chemical lean value (fat content) of ground beef and meat trimmings, as well as the detection and qualification of adulterants in fresh and thawed minced beef.



Tenderness is a characteristic in beef that consumers are willing to pay more for.



NIR spectroscopy can be used in a production environment to quickly characterize carcasses.

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Typical Applications:

- ◆ Prediction of color, texture, and sensory characteristics of beef steaks
- ◆ Measurement of chemical lean (CL) and fat content in meat trimmings and ground beef
- ◆ Detection and quantification of adulterants in frozen/thawed ground beef
- ◆ Predicting tenderness and color in beef
- ◆ Effects of storage time and temperature on chicken breast tenderness
- ◆ Prediction of sensory characteristics of lamb for sorting into quality classifications
- ◆ Discrimination between fish-meal, meat meal, and soya meal samples
- ◆ Analysis of the chemical composition of meat for nutritional guides
- ◆ Rapid classification for sorting of beef carcasses in the plant

The SM-3500 used in this application features:

- ◆ Spectral range of 350 – 2500nm
- ◆ Spectral resolution is 3.5nm (350-100nm); 3.8nm @ 1500nm; 2.5nm @ 2100nm
- ◆ USB and Wireless Bluetooth communications
- ◆ Getac PS236 PDA tags voice notes and pictures to spectra
- ◆ DARWIN SP Data Acquisition software
- ◆ Specially designed contact probe with pistol grip and internal light source
- ◆ 5 watt tungsten halogen source – AC/DC or optional battery pack operation
- ◆ Metal clad fiber optic cable
- ◆ 2x2 inch 99% reflectance standard with custom case
- ◆ TENBA shootout mini backpack
- ◆ Rechargeable Li-ion battery and charger

The contact probe features include:

- ◆ Easily measure surface reflectance at 350-2500nm
- ◆ Comfortable pistol grip with built-in 5 watt tungsten halogen light source
- ◆ Lightweight and easy to carry
- ◆ Plugs directly into the SM-3500 for field use in a processing plant

In addition to the SM-3500 and other portable spectrometers, SPECTRAL EVOLUTION also offers a full range of portable spectroradiometers and lab spectrometers and spectrophotometers. For more information, visit: www.spectralevolution.com.



SM-3500 with custom contact probe for meat tenderness analysis. Other probes and configurations are available for different meat and food applications.



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