

FIBRE OPTIC PROBE DESIGN FOR SPECTROSCOPIC MEASUREMENTS OF MEAT QUALITY

FOP SYSTEM

The design of a fibre optical (FOP) spectroscopic system is attempted with a portable spectrometer from Ocean Optics Europe (Top Sensor Systems, Eerbeek, NL). The FOP system is constructed with a double channel optical cable, with one channel optimised for the ultraviolet to visual (UV-VIS) range (280-730 nm) and one channel optimised for the visual to near infrared (VIS-NIR) range (500-980 nm). Each channel consist of 7 fibres, 1 for illumination of the meat and 6 for collection of the surface reflectance. Thus a total of 14 fibres exist in the optic cable. Each channel is connected to an illumination source and a spectrophotometer. The illumination source for the UV source is a combined Deuterium-Halogen lamp (DH-2000) and for the VIS a Halogen-Tungsten lamp (HG-1000). The spectrophotometers for the two channels are combined in a dual line spectrophotometer (PSD-1000) connected externally to a portable PC via a PCMCIA protocol. Five probe designs have been developed and tested in the laboratory (see Figure 1).

CONCLUSIONS

- Probe design 1, 2 and 5 from Figure 1 was tested in major scale. Design 5 was preferable due to the knife tip, but showed severe durability problems due to glued parts on the probe. This design is still to be preferred in future testing with modifications.
- The illumination requires 45 minutes warm up before being stable (see Figure 2).
- The variation between carcasses is higher for all wavelengths than the variation in each muscle (see Figure 3)
- It was possible to classify a set of Pietrain, which is known to have approximately 75% PSE, pigs from Landrace (see Figure 5).
- Reasonable performance in predicting drip loss was seen in laboratory tests where three insertions in each carcass were averaged (see Chapter 7).

- In an on-line study where one insertion measurement per carcass in a US abattoir with high quality variation, the FOP did not contribute in the prediction performance to the following on-line measurements: pHu, pH, Py. part of the reason is expected to be the lower meat representation because only one insertion was made.

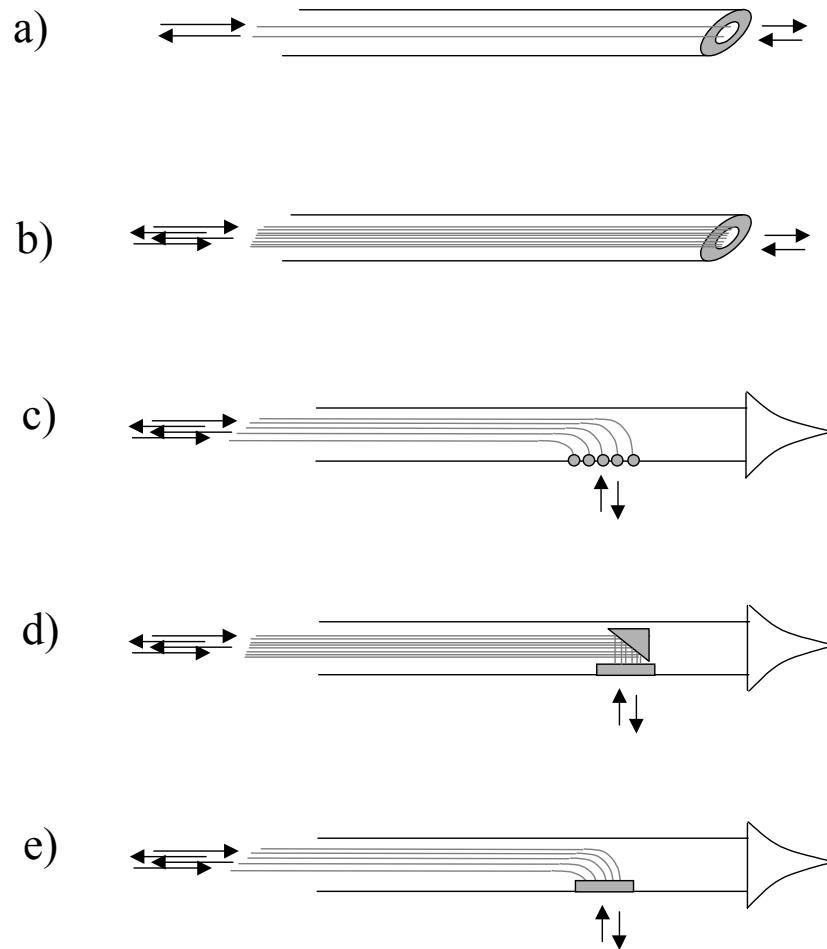


Figure 1. The 5 insertion probe designs tested for the FOP system.

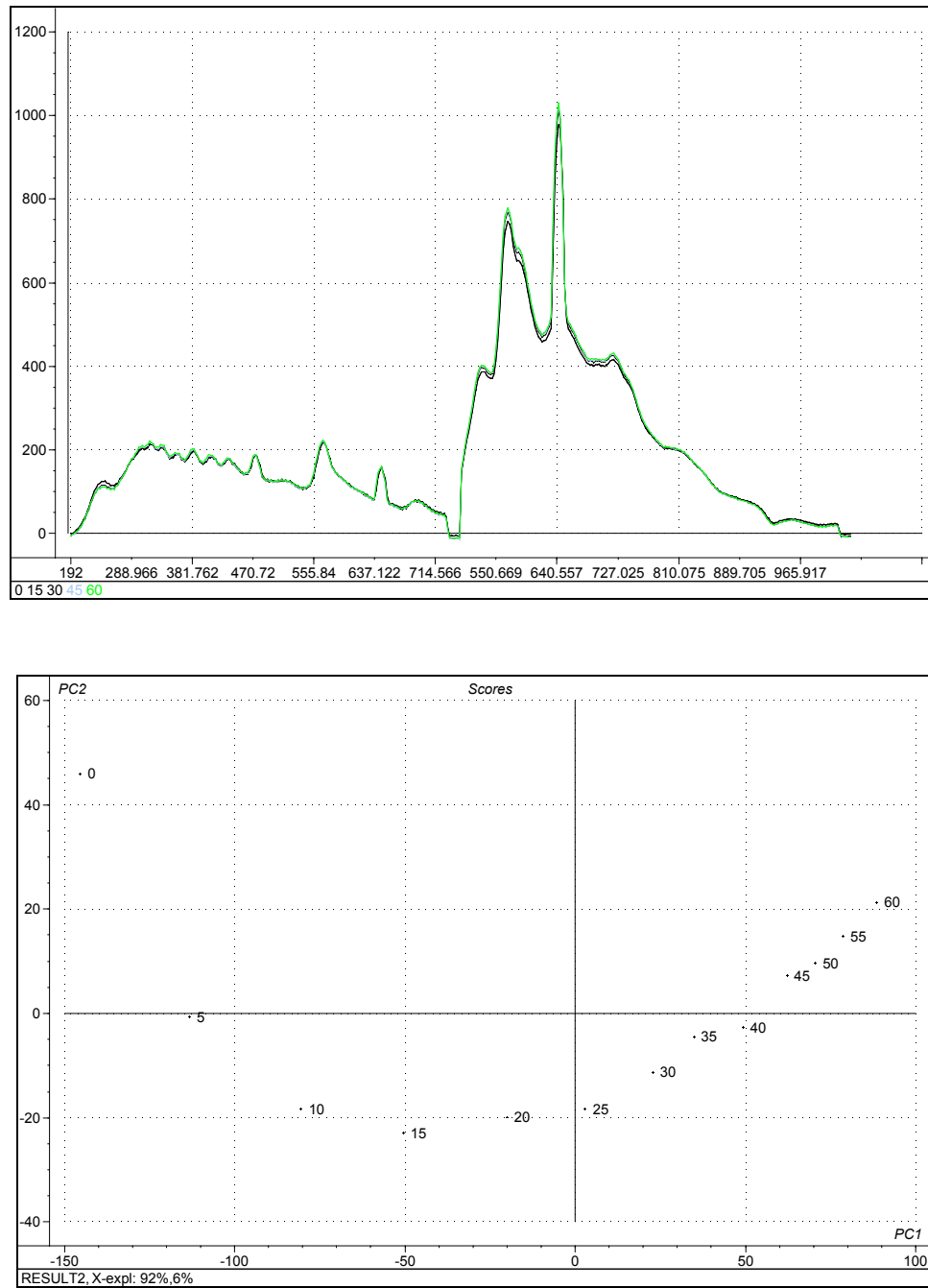


Figure 2. Reflectance of the illumination source using Barium Sulfate powder. Top: Spectra collected with intervals of 5 minutes. Bottom: scoreplot of a PCA performed on the 13 spectra. The labels denote the time since start up.

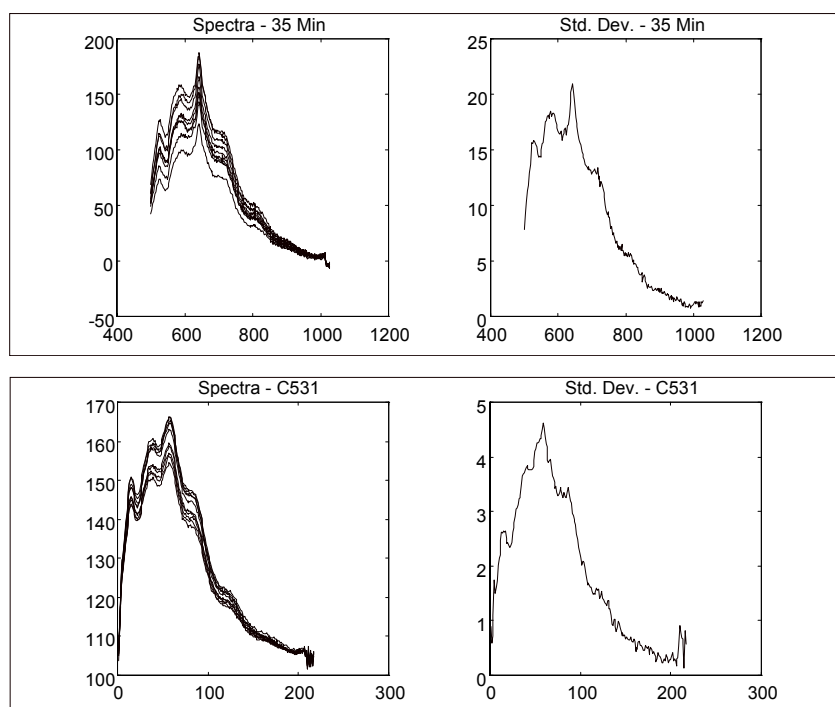


Figure 3: FOP spectra measured in the LD at 35 minutes. Top: 10 different carcasses and. Below: 10 slightly different locations in one carcass. Left: the 10 spectra. Right: standard deviation for the 10 spectra at the different wavelengths.

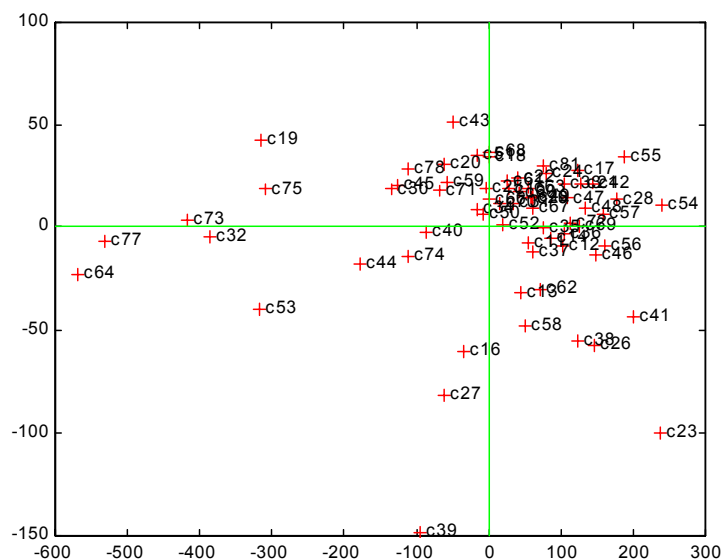


Figure 4: PCA scoreplot of the FOP spectra. The samples c44, c53, c64, c73, c75, and c77 are Pietrain known to be a quality extreme breed.