Drip Loss Determination in Pork Chops with NIR

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Drip loss is an important meat quality trait which is perceived by consumers as juiciness, appearance and color of meat. Therefore, drip loss is of special interest for breeding schemes, meat processing industry and retailers, as well as for research groups involved in selection studies.
Literature reports NIR models with R^2_{CAL} values between 0.31 to 0.71 in pork meat, either in intact form or homogenized.

Figure 1: Drip loss measurement, bag method

Materials and Methods

Samples: Loin samples, 25 mm thick, from 94 pig carcasses (Swiss Large White castrates and females) were collected 1 and 24 h postmortem (pm) and kept at 4°C until drip loss and NIR analysis.

Drip loss (DL)was determined 48 h pm via the bag method (Figure 1)

NIR 500 (Büchi, Switzerland) in diffuse reflectance mode was used at 1, 24 and 48 h pm (Figure 2) Spectra at 4 different spots per sample were recorded, from 4’000 to 10’000 cm^{-1} at 8 cm^{-1} intervals, through a window 3.5 cm diameter. A total of 32 scans were averaged for each spectrum. About 1/3 of the samples, evenly distributed over DL range, were used for validation, the rest were used for calibration, using the NIRCal software from Büchi.

Table 1: NIR model characteristics for the prediction of drip loss in intact pork meat slices

NIR DL	#spots per sample	range[cm^{-1}]	R_{CAL}	R_{VAL}	$Slope_{VAL}$	Bias	SEC	SEP
1 h pm	4	4000-9000	0.67	0.54	0.4	-0.16	1.25	1.31
24 h pm	4	4000-9000	0.79	0.53	0.5	-0.16	1.98	1.43
48 h pm	4	4000-9000	0.79	0.62	0.4	-0.11	1.02	1.13
*48 h pm	1(first)	4000-10000	0.84	0.81	0.8	-0.24	1.04	0.93

Results and Discussion

The set of samples had an average DL of 4.34 ± 1.81 %, with minimum and maximum values of 0.94 and 11.35 %.

The evolution of DL with time could be followed by NIR using principal component analysis PCA (not shown)

When using all 4 scanned spots per sample results comparable to those from literature were found, table 1. Large scattering was observed between the spectra of the different spots per sample indicating probably the influence of the muscular fibers, connecting tissue and intramuscular fat position/distribution.

The systematic use of the first spot only, per sample, allowed the development of a promising calibration model (*48 h pm, Table 1 and figure 3) with a slope of 0.8, an R of 0.81 and a SEP of 0.93 enabling a RPD of 1.95.

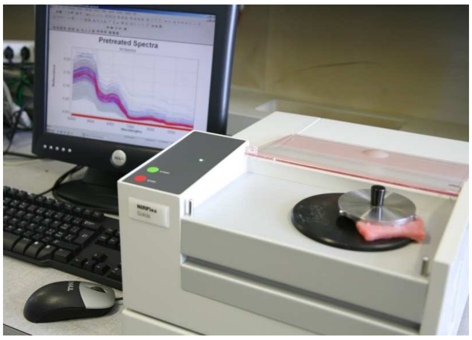

Figure 2: FTNIR (NIR 500, Büchi) diffuse reflectance measurement of intact pork slices using a transflexion cover.

The *48 h pm calibration was achieved with multiplicative scatter correction full pre-treatment and a PLS model with 13 PCs.

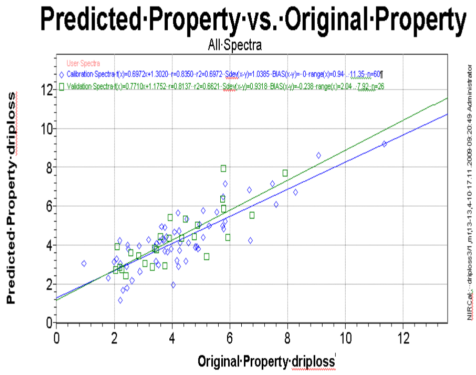

Figure 3: Predicted vs. original drip loss with FTNIR (NIR 500, Büchi) in diffuse reflectance mode of 94 intact pork slices, 48 h pm.

Final Remark

NIR, in diffuse reflectance mode, shows a good potential for the prediction of drip loss in intact slices of pork meat. This technique could be very profitable to selection studies as well as to the meat industry.
The use of one scanning spot per sample made it unnecessary the homogenization of the sample as suggested by some authors in literature. Homogenization was meant to reduce the scattering action of muscular fibers or myofibrils in intact meat slices. However, it would have provoked the severe disruption of the muscle structure, thus altering the water holding capacity of meat and thereby affect the drip loss.

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