NIR PREDICTION FOR PROTEIN AND INTRAMUSCULAR FAT CONTENT OF RABBIT HIND LEG MEAT

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THE GOAL OF THIS INVESTIGATION WAS TO DEVELOP NEAR INFRARED SPECTROSCOPY (NIRS) BASED CALIBRATIONS FOR FAT AND PROTEIN CONTENT OF RABBIT HIND LEG MEAT. TESTING OF THE EFFECT OF SAMPLE NUMBER AND FINDING THE MOST APPROPRIATE WAVELENGTH INTERVAL WAS ALSO APPOINTED. THUS, GENERATING OF FUTURELY APPLICABLE EQUATIONS WAS AIMED.

A TOTAL OF 89 PANNON WHITE RABBITS ORIGINATING FROM TWO EXPERIMENTS WERE SLAUGHTERED AT 11 WEEKS OF AGE (2.4 – 2.5 kg). TOTAL DEBONED HIND LEG MUSCLES WERE HOMOGENIZED. REFLECTANCE NIR SPECTRA OF FRESH AND FREEZE-DRIED SAMPLES WERE RECORDED AS log(1/R) USING A FOSS NIRSYSTEM 6500 SPECTROMETER. GLOBAL CALIBRATION WAS RUN BY WinISI II version 1.5 FOR QUANTITATIVE ANALYSES.

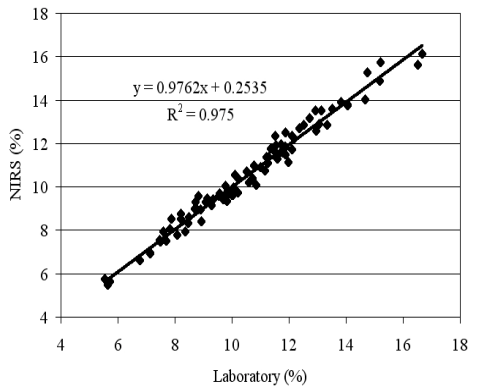
REFERENCE DATA OF PROTEIN AND INTRAMUSCULAR FAT CONTENT WERE DETERMINED BY WET CHEMISTRY. SIGNIFICANT DIFFERENCES (P<0.001) WERE FOUND BETWEEN THE TWO GROUPS CONCERNING THE DRY MATTER BASED FAT AND PROTEIN CONTENT.

Optimization was performed for finding the best wavelength interval for calibration and validation. Results for three intervals are presented by using the samples of different experiments separately and in whole.

			Experiment 1 (n=44)					Experiment 2 (n=45)				
Type	Interval	Const.[1]	Factors[2]	SEC[3]	RSQ[4]	SECV[5]	1-VR[6]	Factors[2]	SEC[3]	RSQ[4]	SECV[5]	1-VR[6]
Fresh	1100 - 2500 nm	Fat	4	0.33	0.975	0.52	0.938	2	0.68	0.901	0.83	0.853
		Protein	4	0.34	0.973	0.53	0.934	2	0.82	0.858	1.00	0.793
	1100 - 1900 nm	Fat	3	0.44	0.955	0.49	0.945	2	0.65	0.907	0.80	0.863
		Protein	3	0.48	0.944	0.53	0.933	2	0.80	0.863	0.96	0.808
	1800 - 2500 nm	Fat	4	0.31	0.977	0.57	0.925	5	0.36	0.973	0.84	0.851
		Protein	6	0.21	0.990	0.53	0.934	2	0.81	0.861	1.05	0.772
Freeze-dried	1100 - 2500 nm	Fat	3	0.32	0.976	0.38	0.967	6	0.14	0.996	0.21	0.990
		Protein	4	0.33	0.974	0.43	0.957	3	0.41	0.964	0.48	0.951
	1100 - 1900 nm	Fat	3	0.32	0.976	0.37	0.968	4	0.18	0.993	0.21	0.991
		Protein	4	0.34	0.973	0.43	0.957	3	0.42	0.963	0.48	0.952
	1800 - 2500 nm	Fat	5	0.26	0.984	0.40	0.963	4	0.19	0.992	0.22	0.990
		Protein	4	0.34	0.972	0.43	0.957	4	0.41	0.964	0.49	0.949

			Entire dataset (n=89)				
Type	Interval	Const.[1]	Factors[2]	SEC[3]	RSQ[4]	SECV[5]	1-VR[6]
Fresh	1100 - 2500 nm	Fat	5	0.38	0.975	0.58	0.941
		Protein	4	0.53	0.950	0.71	0.913
	1100 - 1900 nm	Fat	4	0.50	0.956	0.61	0.935
		Protein	3	0.67	0.921	0.73	0.909
	1800 - 2500 nm	Fat	2	1.01	0.820	1.17	0.763
		Protein	2	1.09	0.793	1.26	0.725
Freeze-dried	1100 - 2500 nm	Fat	5	0.24	0.990	0.30	0.984
		Protein	4	0.40	0.973	0.44	0.966
	1100 - 1900 nm	Fat	3	0.29	0.985	0.31	0.983
		Protein	8	0.28	0.986	0.42	0.968
	1800 - 2500 nm	Fat	4	0.31	0.983	0.36	0.978
		Protein	4	0.43	0.968	0.47	0.961

1: Constituents
2: Number of PLS factors used
3: Standard Error of Calibration
4: Coefficient of determination
5: Standard Error of Cross Validation
6: Fraction of explained variance during cross validation



Calibration line for fat content by using fresh meat samples (n=89)

NIRS IS APPLICABLE FOR QUICK ANALYSIS OF RAW RABBIT HIND LEG MEAT. THE TECHNIQUE IS SUFFICIENT FOR THE ESTIMATION OF FAT AND PROTEIN CONTENT OF MEAT DURING TESTING PROCEDURES . THE DATASET OF 44 MEAT SAMPLES SEEMS TO BE ENOUGH FOR GENERATING ROBUST GLOBAL CALIBRATION EQUATIONS. BEST RESULTS WERE ACHIEVED BY USING 1100-2500nm WAVELENGTH INTERVAL BUT SHORTER RANGES GAVE ALSO ACCURATE AND PRECISE RESULTS. THE EXPENSIVE AND TIME CONSUMING PROCEDURE OF FREEZE-DRYING IS NOT NECESSARY FOR PROPER OUTPUT.

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