PREDICTION OF PHYSICO-CHEMICAL AND TEXTURE CHARACTERISTICS OF BEEF BY NEAR INFRARED TRANSMITTANCE SPECTROSCOPY

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The physico-chemical and texture characteristics of meat determine the nutritional, technological and sensory quality. However, the analysis of meat quality requires expensive, laborious and time consuming analytical methods. The objective of this study was to evaluate NIR spectroscopy using transmittance for determining the moisture, fat, protein and total pigment content, the water holding capacity (WHC) and the toughness of beef meat.

A total of 318 spectra were recorded from ground beef samples by a Feed Analyzer 1265 of Infratec. The samples were obtained from the *Longissimus* muscle of the 10th rib of yearling bulls, ground with an electrical chopper, vacuum packaged, aged during 7 days and frozen at –24°C until the analyses were done. Moisture content was measured by oven drying at 100°C, fat content was determined by Soxhlet extraction and protein content was estimated from nitrogen content using the Kjeldahl analysis. The total pigment content was determined by the method of Hornsey and the WHC using the method of filter paper press. The instrumental evaluation of texture (maximum load WB, maximum stress MS and toughness) was conducted in an Instron equipment with a Warner-Bratzler shearing device. This analysis was performed on a chop of 3.5 cm obtained from the longissimus of the 8th rib, aged during 7 days, kept frozen at -24°C and cooked before the analysis.

Near infrared spectra were recorded as log 1/T (T= transmittance) at 2nm intervals from 850 to 1050 nm using a Feed Analyzer 1265 of Infratec. Calibrations were performed with the WinISI software (vs. 1.02) using the MPLS method. To examine the effect of scatter correction or derivation of spectra on the calibration performance, calibrations were calculated with the crude spectra or pretreated with different mathematical treatments (inverse MSC, SNVD) and/or second derivative operation.

For chemical composition, the use of the scatter corrections improved the calibration statistics, in terms of lower SECV and higher r^2. In most of the variables, the use of the 2nd derivative improved the predictions, mainly when combined with the SNVD treatment. However, for predicting the texture traits, the best estimation was obtained from the crude spectrum.

These results showed that the equations obtained for predicting moisture, fat and total pigments were very accurate, with r^2 being higher that 0.9. However, the prediction of the texture traits (WB, MS, toughness) from ground meat was poor.